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AVOIDING MISUNDERSTANDINGS WITH THE CONSUMER.

At the risk of setting forth some decidedly elementary information regarding rates and service conditions, the central-station contract department does well to prepare its published schedules and rules in a form which leaves as little as possible to future explanation. Common as electrical equipment is getting to be, there are still thousands of people in every city who know next to nothing about the fundamentals of the industry. In recognition of this, the features of a rate-schedule booklet recently prepared by an enterprising company deserve comment. The management realized that in a city with a highly diversified population and a great variety of industries, including many foreign-born residents, a large number of questions are constantly being asked in connection with the establishment of service, including points bearing upon the attitude of the company toward the anticipated business, inspection requirements, the preparation of estimates, handling of applications, uniformity of rates under equal conditions, and the explanation of the most essential technical terms.

In preparing such a booklet for distribution among customers and prospects the company blazed no new trail, but it departed some distance from the ordinary cut-and-dried tabulation of rates and service rules by setting forth in well chosen language the most important information which its customers are seeking. Thus, in its introduction, the company emphasized its desire to serve its prospects and consumers with free power-engineering and illuminating advice, pointed out the unchanged prices for services of similar character, and told the reader precisely where to procure information when in doubt. It then described the procedure in making application for service, which is followed by a call from the company's representative to furnish detailed information and cost estimates, including arrangements through which local contractors bid upon wiring jobs. The necessity of accurately advising the company as to the location of service entrances and the refusal of the company to be responsible for any entrance not designated by its inspector were then set forth. These matters of routine to the company are distinctly new considerations to the average prospect, and their full explanation saves both time and the chances of future misapprehension.

A valuable section of the booklet covers possible reasons for delay in connecting service, saying, "When you sign a contract or agreement for either electric light or power, asking the company to connect you for service, we are anxious to respond at the earliest possible mo-

ment, but we are not always certain that we shall be able to supply you with electricity. We are naturally eager that the sale of current shall begin at once, and we have every desire to give prompt attention to your request, but there are sometimes delays which we cannot prevent. As a protection from possible danger of incomplete wiring in every installation both wiring and fixtures must be inspected and passed before we are allowed to turn on current. We are not allowed to turn on current until we have received a permit from the Inspector of Wires at the City Hall. We apply for such a permit when we get your application, but the city inspector does not examine the wiring until he receives a notice from the wiring contractor or from you, as owner, that the work is ready for inspection. Sometimes this inspection is delayed. It is for your interest to make sure that the contractor notifies the inspector promptly, and it is for you and your contractor to hasten the matter in case of any delay. Another possible reason for delay is that you may have applied for electricity in some place where we have no service in the building, so that we have to build new lines. This usually involves digging up the streets or setting new poles, for all of which we have to get a permit from the city, and we may have to ask you to do something additional to merely signing your application, in which case we will notify you as soon as possible. Please appreciate that our income does not start until the current is turned on and that it is to our interest to serve you as promptly as we can."

This simple, straightforward way of acquainting the customer in advance with the conditions of the service, in addition to the rate schedules for all classes of business, has done much to arouse a friendly public sentiment in a city which but a few years ago was known as one of the most conservative on the electrical map. By going out of its way to make things clear to the customer the company reaps a well deserved reward. Such information as the monthly cost of operating flat-rate lamps through certain stated hours per night for the different sizes of lamps, the time of extinguishing flat-rate sign lighting in stated districts, rates in outlying communities, consent of landlords to the installation and maintenance of equipment and service, liabilities, rights of cutoff, access to premises, non-transferability of contracts, financial responsibility for equipment ownership and maintenance, inability of agents to modify agreements and other moot points which if overlooked might lead to subsequent dispute are properly included, and the booklet closes with a terse explanation of the fundamental electrical units of commercial interest.

There is not the slightest doubt that by thus making things plain to the consumer at the outset, his familiarity with electrical matters is increased, to the resulting development of a larger purchasing power for service, the saving of time which would otherwise be devoted by relatively high-priced employees to explaining the A B C's of service to many competent to grasp the essentials when clearly printed with the rates, and perhaps above all, to the establishment of a good understanding which is the foundation of all future satisfactory relations.

SIDELIGHTS UPON MUNICIPAL-PLANT OPERATION.

The annual reports of municipal electric plants are often difficult to interpret. This should not be so, for the maintenance of proper records is just as important as in a private company, and increasing burdens on the taxpayer sooner or later lead to demands for expert examinations of accounts and equipment, perhaps with overtures to the nearest large central-station or transmission system on behalf of a price for energy which will enable the publicly owned and operated station to become simply a distributing plant. A good many municipalities have found this way out of their electrical problems an easy one, while the central stations have been relieved of a considerable amount of detail work in the local territory and in not a few instances have co-operated generously with the municipal lighting departments in the solicitation of new business. A small residential suburban town within reach of the transmission network of the large central station seldom can expect to produce electricity anywhere nearly as cheaply as the latter, and the quality of service which the private company of large resources can afford to maintain is most appealing to the sensible citizen.

When deals of this kind are under way, it is a great help if full data are available regarding the past performance and costs of the municipal installation. Sometimes these plants are handicapped by frequent changes in administration which have made it impossible to schedule their equipment development along intelligent lines. Thus, in one case, where the station was gradually changed over from a direct-current system to a 2300-volt, 60-cycle, orthdox alternating-current layout, it appeared on examination that numerous combinations of current and voltage had been standardized from time to time during the transition stage; no record existed of the purchase of a single large piece of apparatus new, engines, boilers and generators having been bought second-hand; and it was almost impossible to ascertain the cost of the installation either on account of inadequate records as to detailed equipment or of the passing out of use of similar apparatus units and their discontinuance from manufacture.

As is often the case, the total rated capacity was too small for the growing business of the community, and to add to other complications, the plant was run only at night, the energy for day service being purchased from a neighboring station in another town. Now it was not a very difficult problem to convince the local committee that it would pay to purchase electricity from a neighboring central station, but it is safe to say that a good deal of time and trouble would have been saved in getting at the economic possibilities of the installation had the development been systematic, and failing this, had the operations been analyzed earlier, instead of continuing to run the plant at a loss.

Over and over again municipalities fall into the morass of increased taxes in chasing the will-o'-the-wisp of free street lighting. The practice of making no charge for street lights while appropriations are made to cover the

losses in plant operation simply means that the customers of the plant rather than the citizens as a whole are paying for the street lights. The amounts involved vary locally, of course, but it is far better accounting to charge the city a stated price for street illumination, pro-rating this upon the community as a whole, and trying to develop other branches of business on an equally fair and profitable basis. One cannot get something for nothing, even in working with that invisible but potent form of energy, electricity. Again, greater care in charging up inter-departmental accounts deserves attention. In a combined gas and electric municipal station no separation was made of the proportion of fuel used by the gas department in steam generation, the latter being charged merely an arbitrary sum yearly for the use of steam. The amount of steam used in gas manufacture was not known. Separations of such items must be made even at the cost of a lot of perspiration and evening study, before the true costs and revenues can be appropriately compared. These are merely a few considerations which both the central-station man and the operator of the city plant need to bear in mind in getting together for friendly conferences; for when all is said and done, the problem of purchasing energy or of continuing to produce it locally is fundamentally an engineering question, the answer to which can only be drawn from specific and accurate data which it should be the pride of every operator to maintain.

THE VALUE OF BLUE-PRINT RECORDS OF INSTALLATIONS.

There seems to be a tendency on the part of some contractors and architects to eliminate the use of blue prints for electrical work on small, and even medium-size buildings. Although it is obvious that a definite set of specifications will often result in as good an installation as if blue prints were used, it does not follow, however, that there is no necessity for keeping blue-print records of such installations. In many cases additional lamps are later required and additions and alterations to buildings are often made necessitating changes in the electrical work. The contractor who put in the original installation will have a great advantage over his competitors if he has on hand blue prints showing the location of all concealed wiring, for the contractor will then be able to bid on definite work. If, on the other hand, the architect also has blue prints of the installation it will eliminate all guess work in estimating for any changes in the wiring, and the owner will be able to obtain the changes at a minimum cost.

It is, therefore, obvious that a mistake is being made by numerous architects and contractors in not keeping permanent records of all electrical work done by them and that they should change their policy in this matter, both for their own good and for the good of their clients. In the case of switchboard installations, etc., a diagram of electrical connections should always be furnished to the operator, and should be kept by the latter in an available location.

DEMONSTRATIONS VERSUS PAPERS.

The American Electrochemical Society is one of the newer technical societies of this country, as it is now only in its thirteenth year. With a vitality characteristic of the young it has regularly held two general meetings every year since its birth in 1902. It is also distinguished by initiative and originality, and at the meeting held last week at Niagara Falls, and reported elsewhere in this issue, it carried out a plan which proved of great interest to the attending members.

The innovation consisted in devoting an entire day to demonstrations of electric furnaces and other apparatus in a laboratory suitable for the purpose and providing facilities for all members who cared to bring their apparatus to the meeting for demonstration. This day's work was denominated a symposium on the practical side of electrochemical investigation and resulted in the display of a goodly number of materials and apparatus for use in electrochemical work. This program proved very popular, for out of the total registration of about 230 there were approximately 150 present at these demonstrations. They were sufficient in number to occupy the greater part of a day, and this session was undoubtedly of greater interest than those devoted to the reading and discussion of papers. The precedent is one which may well be followed not only by this society at future meetings but by other societies whose fields lie in the realm of practical applications.

The twenty-sixth general meeting of the American Electrochemical Society was successful not alone in this respect, for the attendance was good, the weather was delightful and the entertainment provided by Section Q was one to be long remembered. The Niagara Falls members have set a pace which it will be hard to maintain.

COMPLETE ANSWERS TO INQUIRIES.

With the development of the modern follow-up system it is often a temptation for a manufacturer answering an inquiry to put the name of the prospective customer upon the circular mailing list and to literally bombard him with piece-meal data on the theory that repeated attacks upon the citadel of conservatism constitute the best way in which to secure orders. In a technical industry like applied electricity there must needs be much interchanging of information, and little ground can be found for criticising the circularizing policy in its proper field —which is not, however, the substitution of the installment plan of giving out data for as full a response as conditions warrant, once a *bona fide* inquiry is received. The manufacturer and his district office representative should never overlook the psychological value of a prompt and thorough treatment of externally originating inquiries in their natural zeal to apply the follow-up system as recommended by advertising specialists.

THE WAR.

By Albert H. Bridge.

By some agency or other very strange news appears to have been circulated concerning the position of affairs in England. It has been almost ludicrous to English electrical men to read in some American electrical papers observations on the position which suggest that on your side of the water we are thought to be so much at war that we are unable to manufacture and unable to trade. It is not wise that any misunderstanding as to the position should be allowed to exist. British electrical factories on the whole are in a state of great activity, and a number of very substantial contracts have lately been obtained for a plant which had previously been ordered in Germany. Experienced heads are being put together in order to prepare adequately for manufacturing those special lines, or many of them, that we have not so far found it worth while to make. We have depended upon other people for these things because we have got into the way of it, also because they have been cheaper, not because we could not make them. Now we are put temporarily into the position of *having* to find alternatives or substitutes, and we shall do so doubtless to a considerable extent. We may find it worth our while to make many things electrical now which, but for the war, we should not have found it convenient to trouble about.

I have written these few lines to let American electrical men know that British electrical manufacturers and traders are still alive—very much alive, and their organization, which has enabled them to secure such great increases in their electrical export trade of the British colonies and dependencies and some neutral markets will be strengthened for greater effort there, while it will widen its scope and bid heavily for favor in the lands of its present allies. In many respects the co-operation of American electrical manufacturers will be needed and welcomed. There will be abundant room for us all.

The Municipal Council of Sydney, Australia, has just reordered from British turbine and electrical firms a 5,000 kilowatt turbogenerator that had previously been contracted for in Germany, and in keeping with the intention of public authorities to assist British industries to remain in full swing in these times of financial stress it is giving exceptionally favorable terms of payment —paying by monthly installments, while the work proceeds up to 80 per cent total by the time of shipment. Questions are being asked concerning the German contracts in connection with railway electrification operations on the London & Brighton Railways' single-phase extensions, as to whether these should not be now given to English works. Some turbo-alternators ordered in Germany by an English colliery company and not yet supplied (one is said to be in ship waiting to come across when the British navy lies at the bottom, another is said to be ready at the works, and a third is nearing completion), are also the subject of questions, and the patriotism of the colliery company is being commented upon, though of course there may be legal questions involved.

Utah Electric Club.

The Utah Electric Club resumed its regular weekly luncheons at the Commercial Club, Salt Lake City, on October 1. Capt. W. G. Webb, of the Utah Battery, talked on "Modern Artillery Practice," illustrating his talk with samples of the various kinds of shells used in the artillery branch of the service. Stanley S. Stevens presided as chairman for the month of October.

During the winter season the Utah Electric Club will hold luncheons every Thursday at 12:30 at the Commercial Club and all visiting members of the electrical fraternity are cordially invited to attend. W. W. Torrence, local manager of the General Electric Company is president and Bayard W. Mendenhall, commercial agent of the Utah Light & Traction Company, is secretary.

Merger of Texas and Missouri Independent Telephone Companies.

The Gary independent telephone interests, which own companies having the same officers at Kansas City, Mo., Joplin, Mo., and Nevada, Mo., all except the last being under the name of the Home Telephone Company, have incorporated the Texas Telephone Company with local headquarters at Waco, Tex. The new company has acquired the following local exchanges in Texas: Waco, Marlin, Waxahachie, Ennis, Orange, Fort Worth, Austin, Taylor, Temple, San Antonio and Port Arthur, and the long-distance connecting lines. J. B. Earle, of Waco, largely interested in independent lines in Texas, brings his holdings to the company, and is the president of the new concern. Theodore Gary, president of the other companies of the associated interests, is chairman of the board of the company; A. F. Adams, vice-president of other companies, is also vice-president of the new Texas company; H. L. Gary is treasurer of this company as well as of the others; E. C. Blomeyer is secretary.

The Gary interests control also the Kansas City Long-Distance Telephone Company, the Home Telephone Company, and have also many smaller exchanges connected with the larger companies. They secured the Joplin and associated exchanges from the Bell interests and have in the past sold to the Bell system exchanges established at Atchison and Topeka, Kans., and at St. Joseph, Mo. A Gary company at Macon, Mo., was disposed of to local interests there.

The new Texas company, as well as the other Gary companies will have central offices at Kansas City.

Kansas City Electric Club.

The first of the series of meetings arranged for this season by the Electric Club of Kansas City, Mo., was held September 29 at the Baltimore Hotel. R. E. Richardson, formerly manager of the Kansas City Electric Light Company, who recently returned from a tour of Europe, told the members what big opportunities would be offered for the exploitation of electrical equipment over there after the war is ended. Mr. Richardson said that Europeans were very far behind the times in their use of electrical appliances, conveniences, switches, etc. He said there were more electric signs in Kansas City than in Paris.

M. J. Moffat, assistant sales manager of the National Carbon Company, Cleveland, O., will be the speaker at the next meeting, October 13, and will show stereopticon views of carbon and carbon products. It is hoped to make these meetings assembly events for the electricians of the Southwest.

International Electrical Congress to Be Postponed Indefinitely.

It is understood that the organization committee of the International Electrical Congress has recommended an indefinite postponement. The Congress was to have been held at San Francisco next year during the Panama-Pacific Exposition. No official announcement of the postponement can be made until the ratification of the recommendation of the organization committee by the Board of Directors of the American Institute of Electrical Engineers at its regular October meeting.

Electromagnet Extracts Bullets.

Professor Delorme, medical inspector-general of the French Army, reports that an electromagnet, having lifting power of more than 2,530 pounds, is successfully used in extracting bullets, with or without anasthesia, at a distance of over four inches from the surface.

W. F. Wells.

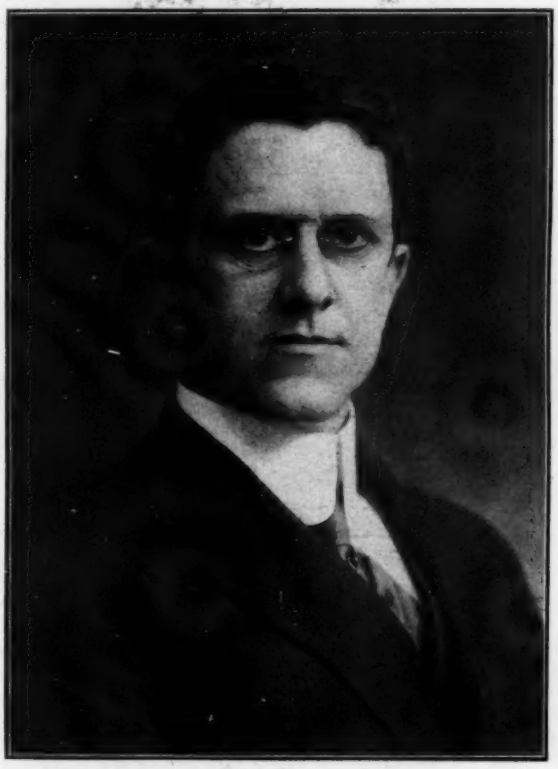
Walter Farrington Wells, vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn, was elected president of the Association of Edison Illuminating Companies on September 17, at the thirtieth annual convention held at White Sulphur Springs, West Va.

Mr. Wells has been prominent for many years in the electrical development of Greater New York. He joined the staff of the Brooklyn Edison Company in 1893 as a draftsman after completing a special course in engineering, higher mathematics and chemistry at Rutger's College.

He progressed gradually from the positon of draftsman to that of electrical superintendent, which post he occupied from 1894 to 1897, when he left the company to become assistant general manager of the Manhattan Electric Light Company. The next four years comprised the period during which the several central-station companies in New York City were being merged into the present New York Edison Company and to Mr. Wells fell the entire responsiblity of arranging the physical details of combining plants. The Manhattan Company being included, Mr. Wells then became one of the district superintendents of the operating department of the New York Edison Company and as such cooperated in the preparation of the plans, and superintended the installation of the electrical plant at the Waterside Station of the company, 38th Street and East River. Upon the completion of this station, in October, 1901, Mr. Wells was appointed superintendent in general charge of its operation.

In 1905, he was offered the newly created position of general superintendent of the Brooklyn Edison Company, and in this capacity re-entered the services of that company, and on January 3, 1913, was elected vice-president and general manager. He is likewise vice-president and general manager of the Kings County Electric Light and Power Company, and vice-president of the Amsterdam Electric Light, Heat and Power Company.

Mr. Wells has been actively connected with the work of the National Electric Light Association for several years, being general chairman of Technical Committees, and recently being reelected treasurer of this body. He is a fellow of the American Institute of Electrical Engineers; member of American Society of Mechanical Engineers, Franklin Institute, Illuminating Engineering Society, Merchants and Business Men's Association of New York, New York Electrical Society and Brooklyn Engineers' Club. His social clubs are the Crescent, Brooklyn, the Engineers' Club, and Delta Kappa Epsilon.



W. F. Wells,
President, Association of Edison Illuminating Companies.

Chicago Jovian League.

John A. Kick, of the Western Electric Company, Chicago, spoke on conditions in the Philippine Islands, at the meeting of the Jovian League of Chicago, on October 5.

A rejuvenation, the last during the adminstration of Homer E. Niesz, was held in the evening and a large class initiated. The floor work was of exceptional merit and the Degree Team, which will compete at the St. Louis convention, received hearty applause. There were 99 applications reported by Victor H. Tousley, chairman of the Membership Committee, although several of the candidates were unable to be present.

Preceding the rejuvenation, dinner was served in the Crystal Room of the Hotel Sherman following which remarks of a humorous nature were made.

Electricity at Boston Domestic Science Exposition.

Electrical exhibits at the Boston Domestic Science Exposition, now being held in Mechanics Hall, Boston, include a demonstration of the Edison telescribe and transphone machines, shown for the first time, and a moving picture, kinetoscope and talking picture show, by Thomas A. Edison, Inc., Orange, N. J. At the latter, audiences of 500 people are given 45-minute performances throughout the day and evening.

The McKenney & Waterbury Company, Boston, are exhibiting electric lighting fixtures, and Alex. P. Maynard, Inc., Boston, is showing a Walker dishwashing machine, a Biltmore electric range and cooks' table, and percolators, chafing dishes, kettles and other appliances that go to make up an "electric kitchen." The Biltmore range exhibited has the novel feature of a metal box at the top of the frame, in easy reach, containng the fuse plugs and operating switches.

The Expositon continues through the month of October.

Deferred Cable Service Restored.

The Great Northern Telegraph Company has announced that it will again accept deferred cablegrams to Denmark and Sweden. Deferred cablegrams may also be sent to Spain and Portugal.

The Western Union Telegraph Company announces that in connection with the Eastern Telegraph Company and the Central and South American Telegraph Company, it has resumed the deferred-rate service to North, East, South and West Africa, Asia, Australia, Dutch East Indies, South America, Great Britain, Norway and Gibraltar.

Chicago Electric Club.

Oscar Nelson, chief of the State Department of Factory Inspection was the speaker at the meeting of the Electric Club of Chicago, on October 1. Mr. Nelson described labor conditions as found by the inspectors and spoke of the functions of the department in improving conditions, particularly in the field of safety work. Stereopticon slides f workshops before and after improvement were shown.

White Way in Winchester.

After several months' experience with a "great White Way" of somewhat limited extent and with two interruptions where two property owners could not see the advantage of such service, Winchester, Ky., has just begun extension of the two rows of light standards and will fill in the two gaps. The "white way" has extended for a matter of four blocks along Main Street, on which are situated most of the business buildings, and all of the lights, five in a cluster to each standard have been lighted every night, greatly improving the appearance of the city. Now the obdurate ones, whose obstinacy or unprogressiveness has been emphasized by the vacancies in the row of lights, have come around to the other business men's way of thinking and the "white way" will be extended northwardly to the crossing of the Lexington & Eastern Railroad, two blocks.

The Franklin Medal Founded by Samuel Insull.

Samuel Insull, president of the Commonwealth Edison Company, Chicago, Ill., has founded, on behalf of the Franklin Institute, Philadelphia, Pa., the Franklin medal. Mr. Insull has agreed to provide for the founding of this medal under the following general conditions:

"1. That an amount not exceeding one thousand dollars should be furnished by him for procuring appropriate designs and dies for the medal and diploma.

"2. That the medal should possess distinct artistic merit, and have on one side a medallion of Benjamin Franklin done from the Thomas Sully portrait in the possession of the Institute.

"3. That the medal should be of gold and have an intrinsic value of about seventy-five dollars.

"4. That the sum of five thousand dollars should be provided by him to be held in trust in perpetuity to be a foundation for this medal, and to be known as the Franklin Medal Fund (Founded January 1, 1914, by Samuel Insull, Esq.)

"5. That the interest of this fund be used from time to time in awarding The Franklin Medal to those workers in physical science or technology, without regard to country, whose efforts have, in the judgment of the Institute, done most to advance a knowledge of physical science or its applications.

"6. That any excess income from this fund, beyond such average annual sum as might be deemed necessary by the Institute for the number of medals it is considered best to award, might be used for premiums to accompany the medals."

The board of managers of the Franklin Institute of the State of Pennsylvania has accepted Mr. Insull's offer. The sum of $6,000 has been paid into the treasury of the Franklin Institute, and $1,000 or so much thereof as may be necessary will be expended for the

Franklin Medal Founded by Mr. Insull.

purpose of paying for the design of a medal and the necessary dies and diploma plates.

The balance of the sum of $6,000 will be invested and from the income derived from time to time there will be struck off and awarded, medals from this design, to workers in physical science or technology, without regard to country, whose efforts, in the opinion of the board of managers of the Franklin Institute, have done most to advance our knowledge of physical science or its application. Should the income derived from the fund be more than necessary for the above stated purpose, the Franklin Institute may in its discretion award so much of the surplus as its board of managers deem

Reverse Side of Medal.

wise as premiums to accompany the medals.

The medal bears on one side a medallion of Benjamin Franklin taken from the portrait by Thomas Sully, now in the possession of the Franklin Institute. The design for the medal was modeled by R. Tait McKenzie, sculptor.

Receivership for Cincinnati Interurban Lines.

On the suit of the Westinghouse Electric & Manufacturing Company, filed at Cincinnati, O., all of the properties of the Interurban Railway & Terminal Company, operating several traction lines running out of Cincinnati, have been placed in the hands of receivers, Charles M. Leslie and Charles S. Thrasher being appointed by the court. The Westinghouse company sued on an indebtedness of $2,483.43 and the appointment of receivers was consented to by the Interurban Company in an answer filed on its behalf. The ground for the appointment of receivers, as set up in the petition was that the property of the defendant company is so incumbered that the rights of creditors and stockholders alike can be protected only by the operation of the lines by receivers, to avoid suits which might result in the suspension of the company's activities.

The bad floods of last year caused the company considerable losses, while two fires destroyed stations on its lines, and recent court rulings ordering five-cent fares caused considerable reductions in revenues. It is believed, however, that the Westinghouse company and other creditors will eventually be paid without difficulty and that the company will be extricated from its difficulties.

Federal Corporation Tax Litigation.

Answer to the suit of the Cincinnati Gas & Electric Company for the purpose of recovering the Federal corporation tax which it has paid for the past four years has been filed by Internal Revenue Collector Gilligan at Cincinnati, O., in which it is alleged that the company had continued to exercise its corporate functions during the period referred to, and was therefore liable to the tax. It is also asserted in the answer that the company failed to bring its suit in time, and that it is barred by the statute of limitations. According to the company returns for the year 1909, its net revenue for that year was $1,536,137.35, on which sum it paid the tax of $15,361, under protest, with similar amounts for the following years; and it is these sums which it is now endeavoring to recover on the ground that, as its properties are operated by the Union Gas & Electric Company, of Cincinnati, it is not actively engaged in business so as to make its revenues subject to the Federal corporation income tax.

Copper Exports.

Export of copper for the week ending September 30 totaled 5,315 tons; since September 1, 19,402 tons; same period last year, 34,314 tons.

The Jovian Order.

The annual convention in St. Louis, Mo., next week will culminate one of the most successful years in the history of the Jovian Order. In point of increased membership as well as in increased activities the Order has established for itself a new place in the electrical industry and its potent influence is being manifested in the stimulation of electrical activities generally.

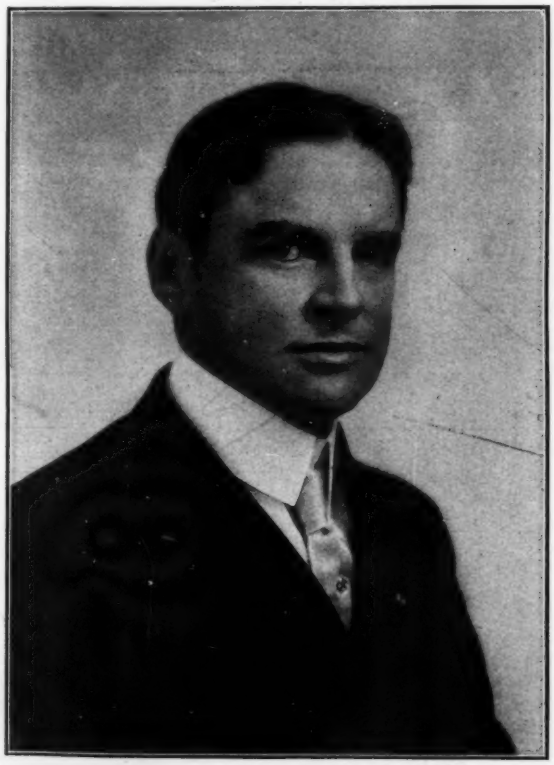
The situation as respects the accomplishments and influence of the Order is admirably summed up by Homer E. Niesz, statesman for Illinois and candidate for the office of Jupiter, as follows:

"In studying the growth and development of the Jovian Order since its inception a little over fifteen years ago, it becomes more and more evident that as its scope of activities has broadened, its numerical strength has increased. It is worthy of note that its transition from a sectional to a national order after approximately seven years of limited usefulness marked the beginning of an epoch not less remarkable in the growth in numbers, but more noticeable in its widening influence and more comprehensive ideals and purposes.

"The great idea of co-operation much discussed and vaguely felt became a factor of vast import when it was actively promulgated as the living basic principle permeating and dominating the great Jovian Order.

"The adoption and inculcation of this propaganda and the attendant slogan, 'All Together, All the Time, for Everything Electrical' had a wonderful influence in the betterment of trade conditions in the electrical industry everywhere. It became evident to the thinking men that the Order possessed possibilties for improving standards of work and advancing the efficiency of its members and soon the active and prominent leaders in the various branches of the industry joined and became identified with the movement. The social features and the high ideals of co-operation, while of inestimable value, to the organization constituting as they do the fundamental plan and ground work for further development, were not sufficient to satisfy the master minds that were directing the destiny of a constantly and rapidly growing body, which required still further scope for its virile activities.

"A need was felt for what might aptly be termed Practical Jovianism and the formation of the Commercial Division of the Jovian Order was the result. This highly important function of the organization has during the past year been developed to an extent that has made its usefulness and value to the membership indisputably great. It has in active operation an Employment Bureau where employers can find trained and competent men and where men can find positions they are qualified to fill.



W N. Matthews,
Reinin Jupiter of the Jovian Order.

"It has established 'Jovian Hotels' in a large number of cities where traveling members can get information, get in touch with local Jovians, and secure special rates on their bills.

"It has worked out an educational plan and is ready to furnish to members a special correspondence course in salesmanship to suit the requirements of the electrical field at a price favorable to members.

"These are important but mark merely the beginning of the practical utility of this Division of the Order.

"The twelfth annual meeting to be held in St. Louis October 14, 15 and 16, will be the occasion when the future lines of work will be discussed and planned and there are many ways in which Jovianism may be advanced and its value to its members and to the industry greatly enhanced.

"This organization of 15,000 men is an instrumentality of vast potential possibilities. It touches all the various electrical organizations and is the common bond of union which should bring them closer together in harmonious relation to the end of promoting the best efforts and obtaining greatest mutual benefits.

"The Jovian Order, by proper direction of effort, can make two kilowatts grow where only one grew before and this can be accomplished by the continued co-operation of the engineer who designs, the manufacturer who constructs, the jobber who sells, the contractor who installs, the utilty man who furnishes the juice and the consumer who pays the bill."

Of course the crowning feature of the year's work will be the annual meeting, which, in attendance, importance of business sessions and entertainment is confidently expected to surpass any other convention of the Order. The program, in slightly condensed form, appears on other pages.

Historical.

The early history of the Jovian Order is too well known to all electrical men to need narration here. The idea of the Rejuvenated Sons of Jove, as it was formerly called, has been electrical in its effect as well as its purpose. It was originated among the leading spirits of a large gathering in Austin, Tex., in May, 1899, upon the occasion of the annual convention of the Southwestern Gas, Electric and Street Railway Association. For the succeeding five years, or, to be exact, until August of 1904, the activities of the Order were confined to the Southwest, particularly Texas, but on August 17, 1904, a class of 27 candidates was initiated at Sandusky, O. Since that time the Order has grown with a rapidity astonishing to its founders—who were men from many states in the Union, and for the most part experts in their profession, and holding responsible offices in the electrical world.

PROGRAM.

Twelfth Annual Congress.

Tuesday, October 13.

Registration.

Booth, Second Floor, Planters' Hotel, Open from 9 A. M. to 11 P. M.

Evening—8:30.

Informal Reception to Past Jupiters. Dancing, Planters' Hotel, Second Floor. (Business Dress.)

Visiting Ladies are Requested to Register in Ladies' Reception Room.

Wednesday, October 14.

Registration.

Booth, Second Floor, Planters' Hotel, Open from 8:30 A. M. to 5 P. M.

Visiting Ladies are Requested to Register in Ladies' Reception Room.

9:30 A. M.

Formal Opening 12th Jovian Congress, Planters' Hotel, Second Floor.

Address of Welcome by Hon. Henry W. Kiel, No. 12,312, Mayor of the City of St. Louis.

Response by Elbert Hubbard, No. 6837, Statesman-at-Large, The Jovian Order.

10:30 A. M. to 1 P. M.

Business Session.

Adoption of Order of Business.

Reading of Mercury's Annual Report.

Appointment of Nominating and Other Committees.

2 P. M. to 11 P. M.

"Avrenim Night"—Dedicated to the Ladies.

A Forty-Mile Ride to Sunset Hill Country Club, the Most Picturesque Country Club in the World, Crowning the Famous Meremec Hills and Affording a Sunset Unrivaled in Marvelous Beauty Here and Abroad.
Dinner Dance.
Music.

Entertainment, Including an Exhibition of Modern Dances by Skillful and Attractive Exponents, and Real Singing by the St. Louis Jovian Glee Club.

Automobiles will Leave the Fourth Street Entrance, Planters' Hotel, Promptly at 2:15.

Thursday, October 15.

9 A. M. to 11 A. M.

Business Session, Planters' Hotel, Second Floor.

11:05 A. M.

Commercial Division Session—Address by John R. Galloway, No. 1580, of Washington, D. C., President of National Electrical Contractors' Association on "Relation of the Contractor to the Several Other Branches of the Electrical Industry."

12 M. to 3 P. M.

Trip by Special Street Cars to the Famous Anheuser-Busch Brewery, the Largest Brewery in the World. Luncheon Served at the Brewery.

An Announcement Covering Time and Place for Boarding Cars will be Made at Close of Business Session.

12 M.

Reception and Luncheon Tendered Visiting Jovian Rotarians by St. Louis Rotary Club. American Hotel Annex, Sixth and Market Streets.

3:15 P. M. to 6 P. M.

Competition Between Degree Teams Representing Chicago, Cleveland, Memphis and St. Louis.

Prizes: Silver Loving Cup, which Remains in the Keeping of the Winning Team for One Year and Becomes the Permanent Property of any Team Capturing it for Three Successive Years. Winning Team also Receives $250 Cash.

The Individual Who Best Portrays His Part, Regardless of What Team He Works With,

Receives a One Hundred Dollar Jewel of His Own Selection. All Past Jupiters Present Act as Judges in the Contest.

Competition Held at Garrick Theater on Chestnut Street Between Fifth (Broadway) and Sixth Streets, One Block from the Planters' Hotel.

8 P. M. to 11:55 P. M.

Annual Rejuvenation and Special Entertainment, Including

8:00—Introductory Remarks by Ell C. Bennett, No. 3932-13, Tenth, Eleventh and Twelfth Mercury.

8:15—A Talk by Fra Elbert Hubbard, No. 6837, on a Subject to be Selected by Himself.

8:45—Annual Rejuvenation by the Degree Team of the St. Louis Chapter.

9:55—A Few Words From Our Twelfth Jupiter, W. N. Matthews, No. 496-44.

10:10—A Contribution From Jovian Stentors.

10:55—Boxing Exhibition—Preliminary, Four Rounds.

11:10—Final—Six Rounds.

11:45—A Surprise—a Dark Secret—Don't Miss It!

Friday, October 16.

9 A. M. to 10 A. M.

Business Session—Planters' Hotel, Second Floor.

10 A. M. to 12 M.

Commercial Division Session—Address by Paul M. Lincoln, No. 5026, Pittsburgh, Pa., President American Institute Electrical Engineers. Subject: "Co-operation Between Allied Electrical Associations."

Address by Alfred C. Einstein, No. 5760, St. Louis. Subject to be Selected by Him.

Address by W. E. Robertson, No. 424-6, Buffalo, N. Y. Subject: "Elements of Successful Selling."

2 P. M. to 6 P. M.

Business Session and Election of Officers and Stentors, Moolah Temple, 3821 Lindell Boulevard.

Meeting Will be Opened by an Address by Fra Elbert Hubbard, No. 6837. Subject: "The Possibilities in the Commercial Division of The Jovian Order."

8 P. M.

Closing Banquet and Entertainment, Moolah Temple, 3821 Lindell Boulevard.

LADIES' PROGRAM.

Visiting Ladies are Requested to Register in Ladies' Reception Room, Second Floor, Planters' Hotel, and State at That Time What Entertainment They Will Attend in Order That Proper Provision Can be Made for Them. Members of the Ladies' Committee Will be in Attendance at All Times.

Tuesday, October 13.

Evening.

Reception and Dance.

Wednesday, October 14.

Automobile Trip to Sunset Hill Country Club. Dinner Dance and Entertainment, Dedicated to the Ladies as "Avrenim Night."

Thursday, October 15.

In the Afternoon an Automobile Trip Through Shaw's Garden, the Most Famous Botanical Garden in the World.
In the Evening a Card Party.

Friday, October 16.

Evening.

A Theater Party.

The Ladies' Program in Detail is Given on Special Programs on Distribution in Ladies' Reception Room.

Ladies Desiring Automobiles for Shopping and for Special Sight-Seeing Tours Will be Supplied Through the Courtesy of the Automobile Committee. Requests Should be Made to the Chairman of the Ladies' Committee, Mrs. W. N. Matthews.

Membership.

At the end of the first year of the Order's existence the total membership was 44. In 1904 this had been increased to 178 and in May of 1911 the total membership had only reached the figure of 4,181. From this date the growth of the Order has been phenomenal, and without precedent in the history of simlar organizations. In Chicago on October 5, 1914, a class of 99 candidates was initiated which brings

T. H. Bibber, Pluto.

the total membership of the Order today well above the 15,000 mark.

During the reign of Jupiter Matthews 2,868 new members were initiated. This figure does not take the September rejuvenations into consideration, the returns from which will undoubtedly make the record of 1913-14 one that will be hard to equal. Last year a total of 3,656 new members were added.

E. A. Wilcox, Mars.

An analysis of the total membership of the Order indicates a substantial representation in practically every branch of the electrical industry. The manufacturers, of course, lead with over 6,000 members and central-station companies, jobbers, contractors and retailers, and electric railways follow in the order named. A further analysis reveals the fact that the number of

A. H. Halloran, Vulcan.

Jovians holding the positions of presidents and owners is second only to the number classified as purchasing agents and department heads.

Luncheon Clubs.

The keynote of the Jovian Order is commercial co-operation and its

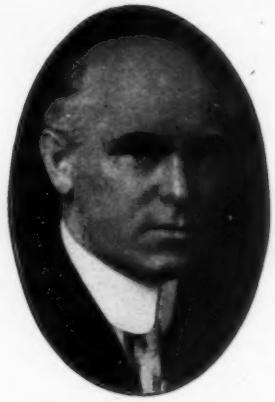
G. C. Richards, Apollo.

avowed purpose as incorporated in its constitution is "to bring the devotees of the science of electricity and its kindred schools into a closer communication and companionship, to the end that information and learning might be more generally and effectually dif-

M. H. Jones, Triton.

fused; that love and pride of profession might be instilled in every heart, brotherly feeling engendered, and that ties and links be forged at the anvil of Vulcan which shall lengthen until the chain encircles the globe, thus cementing forever its membership in a common bond of interest, which shall include the loftiest savant and the humblest aspirant."

The most efficient agent for the realization of this object is the Jovian



G. C. Rough, Hercules.

League or Lunch Club, of which there are 63 in active operation today, including nearly all of the large cities in the United States and Canada. These clubs all have definite schemes of operation and are thoroughly organized, usually with the local Jovian statesman as presiding officer. The benefits to the industry in the cities in which these clubs are in operation are im-

L. V. Nogueira, Avrenim.

measurable. They have proven the value of the "get-together" doctrine and by bringing men of the same industry together socially to discuss their affairs in a friendly spirit have eliminated much bitterness and antagonism.

At meetings of the Jovian Leagues, held weekly or bi-weekly, educational possiblites are not overlooked and brief after-luncheon talks are arranged

for on subjects of interest and pertinence to the members. These talks have resulted in the dissemination of much useful information and as a clearing house for the exchange of ideas and the free discussion of the problems of the professon, or of local conditions.

In many instances electrical shows have been promulgated by these leagues, the most notable instances being the recent expositons held in Cleveland and Buffalo, respectively. In several cities the leagues have orignated and are pushing to consummation legislation which will greatly benefit the electrical industry locally. In other cities the leagues are co-operating with local civic bodies in campaigns for the advancement of movements conductive to the public good, thus in a broad manner furthering their own interests.

Commercial Division.

One of the most important developments in the Jovian Order was the establishment at the New York convention of the Commercial Division. Under this division much of the actual co-operative work of the Order is prosecuted. One of the most recent acts of the Commercial Divsion was the establishment of Jovian hotels in a large number of cities where traveling members can secure special rates on their bills. Other functions of the Division have been mentioned previously and plans have been made to carry out much additional work along similar lines.

Taken altogether, the work accomplished during the year has been of a standard that will be hard to equal in the future. The officers of the Order, responsible for the successful administration of its affairs are as follows:

Jupiter, W. N. Matthews, St. Louis.
Neptune, M. F. Knapp, Pittsburgh.
Pluto, T. H. Bibber, New York.
Vulcan, A. H. Halloran, San Francisco.
Hercules, George C. Rough, Toronto, Can.
Mars, E. A. Wilcox, Twin Falls, Idaho.
Apollo, George C. Richards, Chicago.
Triton, M. H. Jones, Baltimore.
Avernim, L. V. Nogueira, Dallas.
Mercury, Ell C. Bennett, St. Louis.

St. Louis Convention.

The program for the St. Louis convention is sufficient indication of the efforts that have been extended to make the twelfth congress a success. The following committees are deserving of great credit for their untiring efforts in arranging for the comfort and entertainment of the visitors:

General Committee: H. J. Pettengill, chairman; W. N. Matthews, first vice-chairman; Ell C. Bennett, second vice-chairman.

Entertainment Committee: H. D. McBride, chairman; E. H. Waddington, Paul Gleeson, M. J. Wolf, J. V. Baker and W. R. Colcord.

Transportation Committee: Hermann Spoehrer, chairman; Bruce Cameron, E. A. Cheney, Walter P. Holcombe, R. J. Russell.

Ell C. Bennett, Mercury.

Registration Committee: F. D. Beardslee, chairman; Ell C. Bennett.

Program Committee: Ell C. Bennett, chairman; Grattan Kearns, O. C. Small, W. R. Joyes.

Automobile Committee: E. H. Waddington, chairman.

Reception Committee: Walter Robbins, chairman.

Promotion Committee: M. J. Wolf, chairman; E. H. Waddington, vice-chairman; H. D. McBride, S. A. Hobson, F. D. Phillips, G. E. Cullinan, A. S. Partridge, Fred Johnson.

Decoration Committee: C. E. Michel, chairman; W. E. Rolfe, F. A. Kehl, C. G. Sperry, M. O'Brien, M. J. Wolf, J. I. Wheeler.

M. J. Wolf,
Chairman, Promotion Committee.

Ladies' Committee: Mrs. W. N. Matthews, chairman.

Finance Committee: F. A. Kehl, chairman; H. H. Humphrey, J. H. Fenton, C. E. Michel; Fred Johnson, general secretary.

Badge Committee: J. P. Casey, chairman; W. L. Rose.

Hotel Committee: L. S. Hunt, chairman; J. P. Casey, F. D. Phillips, W. E. Rapp, L. B. Rosebrough.

Publicity Committee: Bruce Cameron, chairman; Humphrey Sullivan, O. C. Small, E. D. Anderson.

Membership and Rejuvenation Committee: G. E. Cullinan, chairman; Carl Lance, H. L. Hoffman, W. G. Barry, T. C. McClelland.

In addition to the entertainment features already mentioned, many of the St. Louis manufacturers have extended cordial invitations to all visiting Jovians to inspect their establishment. The Wagner Electric Manufacturing Company will have guides on hand who will be prepared to take visitors to the company's factory for a thorough inspection of this modern plant. Lunch will be served.

The Century Electric Company also invites the Jovians to inspect its new factory and has made preparations to entertain all who call.

The Union Electric Light & Power Company will spring a novel feature. This company will throw on a 12-foot screen the likeness of each of the 800 St. Louis Jovians in the act of welcoming the visitors.

Special trains will be run to St. Louis from many points. A special leaves Chicago, over the Chicago & Alton Railroad at 11:30 o'clock, Tuesday morning. G. A. Freeman is in charge of arrangements.

Illumination Attracts to Merchants' Display.

The merchants on McGee Street between Eleventh and Twelfth Streets, which is somewhat out of the main shopping district of Kansas City, Mo., decided that if they were going to get anyone to look at their windows during the recent "Fashion Show," they would have to use unusual methods to do it. Consequently they decided to make their block so attractive that people could not help noticing it, and, since the window displays were viewed mostly at night, electric lights were the chief factor in their plans. The Kansas City Electric Light Company agreed to supply the power for any decorative scheme they might devise. The merchants decorated the trolley pole brackets with golden-rod and purple bunting, these being the Fashion Show colors. Then they had 250-watt tungsten lamps hung in the middle of the street at distances of about twenty feet for the entire length of the block. The result was that the street was a veritable blaze of light. The experiment was so satisfactory that the merchants are thinking of making the illumination a permanent thing.

Commercial Practice
Management, Rates, New Business

Increase in Kansas City.

A very marked increase in the number of users of electricity was made this summer and fall by the Kansas City Electric Light Company. Louis F. Egan, manager, estimates that the net gain in the number of meters installed was 50 per cent greater in four months than the net gain in the same four months of 1913. Some of this gain was due to the growth of the city and the influx of new families; but a great deal was doubtless due to the special campaign of the company through its offer of wiring kitchens alone at a low rate and on easy terms. A variety of appeals was made in the advertising for this campaign in addition to the bargain offer; many different pieces of equipment were suggested at different times, an iron, appealing to one, a toaster to another, etc. The heaviest efforts were put forth on the subject of the safety of electric lights, and their convenience, and many of the advertisements probably made lasting impressions. It is interesting to note that the number of consumers—houses wired in Kansas City is now about one-third the number of houses served by the water department, and is a still larger proportion of the number served by the gas company. Naturally there are several districts of old or very small residences where the trend of development is now uncertain and where electricity probably would not be installed until the future of such districts is more certain.

The special campaign of the company to interest the housewife in the use of electricity culminated October 1 in the autumn electric festival. The main floor of the company's building at Fifteenth Street and Grand Avenue was turned over to Miss M. J. Russell, manager of the Electric Shop, and every square inch was filled with devices useful to the housewife. Many of the large manufacturers of electrical household equipment and Kansas City jobbers and retailers had space in which they fitted up elaborate displays and made demonstrations and several of the latest devices were shown for the first time. Special invitations had been sent to Kansas City consumers and prospective consumers of electricity and the demonstrations were aimed to interest these.

Rural Electrical Development in Indiana.

One of the papers presented before the Indiana Electric Light Association on September 23 that aroused great interest was that by Alex. R. Holliday, of Indianapolis. The title of the paper was "Rural Electrical Development in Indiana." An extended abstract of this interesting paper follows.

While Mr. Holliday's paper dwelt particularly on conditions in Indiana, it contained much of general interest on the possibilities of rural development. The improvement in the farmer's standard of living and his excellent financial condition due to high prices obtained for farm products prompt him to seek central-station service in order to obtain the convenience of electric light and the mechanical power increasingly needed to overcome the scarcity of farm labor. Probably half of Indiana's population is living in the country, or in very small towns beyond the present reach of central-station lines. To reach the average rural customer entails about five times the line and transformer cost of reaching a city customer. There are seldom more than four rural customers per mile of line and each requires a transformer. However, each rural customer can be developed into a larger customer than the average city customer because of the use of power on the farm.

In Indiana only 13 companies are reported to have more than 10 rural customers and only three have over 100. In some cases the customer pays all of the line cost, giving the company the option to buy back the line; in other cases the company meets the entire expense. The Noblesville Heat, Light & Power Company has 214 rural customers and has actively developed the business. At first a few customers were taken on along transmission lines. A special form of contract was used for the extensions that were eagerly sought. The company builds and maintains the line for a minimum of four customers per mile; each customer pays $50 toward the line cost and this is refunded in current. Each customer pays for his own service connection, transformer and wiring. This is cheaper and more serviceable than an acetylene lighting outfit. The average annual revenue from the 23 customers served over a year is $17.58, which is not profitable but a good start. The average line cost per mile is $242.23 for material and labor, or about $300 including insurance, interest, etc. Assuming 60 per cent of gross revenue for operating expenses leaves 40 per cent for interest, depreciation and profit; setting aside 12 per cent for interest and depreciation makes these charges $36 per year per mile of line. Consequently until the annual net revenue per mile exceeds $36, or $3 per month, there is no profit. Power and lighting currents are passed through the same meter, which is read every three months. The meter reader also makes suggestions for improving and increasing the service. The Noblesville company also rents for $5 a day a portable power outfit, consisting of 15-horsepower motor and transformers; this charge includes current and is much cheaper and more useful than renting of a traction-engine outfit. The practice of several other Indiana companies, differing slightly from the above and not so highly developed, was also reported in the paper. All of the companies developing this business have placed the rural customer on a different basis from city customers, which is fair, since each class must bear its own share of costs. City customers would quickly complain, if their rates for current were made high in order that the farmer should have the use of it also.

Future development possibilities are taken up in the second part of the paper. Development of rural business is warranted only because of the demand for power in carrying on the intensive and scientific farming that becomes increasingly necessary. This increases the farmer's profits and makes it possible for him to increase the investment in his equipment. One of the best methods of increasing the yield per acre is by the artificial application of water to the crop. In arid regions irrigation is absolutely essential; in Indiana and similar states it is crop insurance and promotes larger crops at earlier maturities. It pays on all crops where the gross yield is over $100 per acre, such as market vegetables, berries, flowers, etc. Electric pumping is the ideal method of putting water on the crop. It permits pumping water from a stream or well directly or to a tank or reservoir, from which it is distributed over the fields by gravity, as needed. Whether distribution is by open furrows, tile pipes or overhead sprinkling pipes

depends on the crop and lay of the land. Gravity canals, laterals and furrows are usually the cheapest in first cost, but require more labor to irrigate and maintain; the first cost may vary from $10 to $100 per acre. The equipment for overhead sprinkling, including motor, pump and piping, costs about $250 per acre. A one-horsepower motor running four hours per day can supply at least six acres by alternate application to different parts. Operating six hours per week per acre for a period of ten weeks requires 40 kilowatt-hours or $4 for current; other items, such as interest, depreciation, labor, etc., make the total cost per acre $56.50. The United States Department of Agriculture has developed a system with cement main pipes, valves and portable iron lateral piping, which costs but $50 an acre. By irrigation the yield per acre can be made from $300 for potatoes to $1,000 for lettuce and radishes; the cost of irrigation is but a small item in view of this handsome return. At 10 cents per kilowatt-hour, the cost of current is but about one-tenth of the total cost of irrigation and is much cheaper than gasoline or steam pumping.

Electric cooking should prove profitable to the farmer. It will be but little, if at all, more expensive than cooking with gasoline, as is commonly done in summer, and is very much safer. Many installations of electric ranges among rural csutomers have proven very satisfactory and have cost from $2.50 to $5 per month for current. The first cost of the range is rather high, however; adaptation of fireless cookers to electric ranges has increased their efficiency and usefulness. The average farmer can afford to pay $3 per month for cooking. Dairying offers a good load. The Ontario Hydro-Electric Commission supplies about 150 farms in southwestern Ontario, among which are several dairies that consume up to $150 worth of current annually, nearly all for power. Feed grinding, filling of silos, cutting wood, running grindstones, etc., are other demands for power. An electric water-heater taking but 600 watts for many hours and having a heat-insulated tank, has been found very useful in the dairy and other parts of the farm houses. The farmer should be trained to long-hour use of electricity and given rates based on load-factor. An important feature of electricity on the farm is that it helps materially in making farm life more attractive. It reduces the drudgery of prolonged and irksome manual labor.

In the third part of the paper Mr. Holliday discussed financial considerations concerning the advisability of encouraging rural development. In order to serve the major portion of the 215,485 farmers in Indiana, will require an investment in additional station and line equipment by central stations of probably $75,000,000. Since this can not be taken from the little surplus earnings of the present, outside capital must be invited. Mr. Holliday pointed out that capital demands a wage as definite as that of labor. The investing public has preferred the more conservative 6 per cent farm mortgage to the rather speculative 7 or 8 per cent offered by public utilities. The securities of the latter are threatened by hostile public sentiment toward corporations, by drastic legislation and arduous commission regulation. The uncertainties of the present discourage the entrance of capital into the utility field. Conservative investors, as well as promoters, have been driven into other lines.

The common opinion that physical valuation of the plant is the only basis for rate determination is both fallacious and dangerous. The important intangibles, such as good will and going value, must be allowed in valuations. A tendency to allow nothing for the cost of displaced obsolete equipment means that such will have to be kept in use long after it should have been discarded and therefore inefficiency and restricted service will result. The physical assets of a plant are usually less than its outstanding securities, but these can not be scaled down without grave injustice. Public opinion is against the issuing of watered stocks: it also believes that six per cent is sufficient return for a nontaxable stock paid for in cash at par. New capital can not be secured for utilities on this basis, however. Large utilities may secure it at seven per cent, but smaller plants must pay eight per cent or more. Until the financial outlook is brighter, rural electrical development in Indiana must be held in abeyance. Ample and sure returns must be guaranteed to capital by commission decisions to attract the necessary capital to this field.

Attractive Window Display.

An interesting and timely window exhibit was made during the heated term of last week by the Worcester Electric Light Company, Worcester, Mass. An 80-pound refrigerating plant, manufactured by the Auto Refrigerating Company, Hartford, Conn., was shown in operation. The pump connected to a two-horsepower motor supplied water and ammonia to the system, an indicator dial on a panel board showing the pressure of each constituent. Cotton batting sprinkled with glittering crystals lined the floor and simulated snow, while the ice-coated coil of pipes attracted agreeable notice.

It has been estimated that the waterfalls of Sweden are capable of developing 6,000,000 horsepower, of which only about one sixth is now utilized in hydroelectric plants.

New York Electrical Exposition Larger Than Ever.

The New York Electrical Exposition and Motor Show opened at the Grand Central Palace, October 7, with a larger number of exhibits than ever before. Over 30 electric automobiles are shown. They will participate in many important mileage tests. Three floors of the Grand Central Palace are filled with exhibits, the majority of which are operating. The United States army and navy have arranged a comprehensive display of war-time electrical equipment. A complete electric printing shop is of special interest. The use of electricity in the residence and in shops, bakeries, laundries, dairies, chicken incubators, electrotherapeutics, hospitals, etc., is well represented, and current-consuming devices of all kinds are shown in operation. The attendance on the opening afternoon and evening was large. The exposition will continue until October 17.

For the purpose of demonstrating the possibilities of the modern electric vehicle, both of the pleasure-car and motor-truck types, the New York Electric Vehicle Association has perfected plans for the running of a series of mileage tests during the Electrical Exposition and Motor Show. These tests will be run on the board track, which is laid out each year on the third gallery of the Grand Central Palace, for showing electric vehicles in action.

One of the tests will be for the greatest mileage on a single charge of the battery. It is open to all types, but will probably be contested by runabouts, with one or two possible entries of light delivery vehicles. The present record is said to be 244.7 miles, made on the streets of Cleveland, O., in 1911. The road record is 176 miles made recently in a run from Boston to New York.

Campaign to Stimulate Business in New England.

The New England Section, N. E. L. A., has announced a plan by which its secretary, Miss O. A. Bursiel, offers to give lectures before Women's Clubs and other organizations on the subject of electricity, with the aim of familiarizing home-makers with the labor-saving electrical appliances. The opportunity is offered to central stations of New England to engage the lecturer's services, notifying the office at least a week in advance. A demonstrator will be furnished if desired, and the use of a stereopticon is available. It is believed by officers of the New England Section that great benefit will accrue to lighting companies through the enthusiastic presentation of the subject by the lecturer.

Electric Vehicle Data

Electric Vehicle News of the Week.

Plans are being made by the Electrical Vehicle Association of America for a transcontinental run over the Lincoln Highway next summer, in which both pleasure and commercial electric vehicles will participate. The series of mileage tests being held on the indoor track at Grand Central Palace, New York City, during the present Electrical Exposition and Motor Show, have been arranged largely to furnish the mileage data needed for preparing a schedule.

The principal mileage test at the Electrical Exposition and Motor Show will be made by the General Vehicle Company, which is operating one of its 1,000-pound delivery wagons, continuously during the ten-day period of the Show. Two batteries are provided and while one is in use the other is recharged. This plan is followed in several commercial installations where high daily mileages are required. With proper facilities the changing of batteries requires but a few moments.

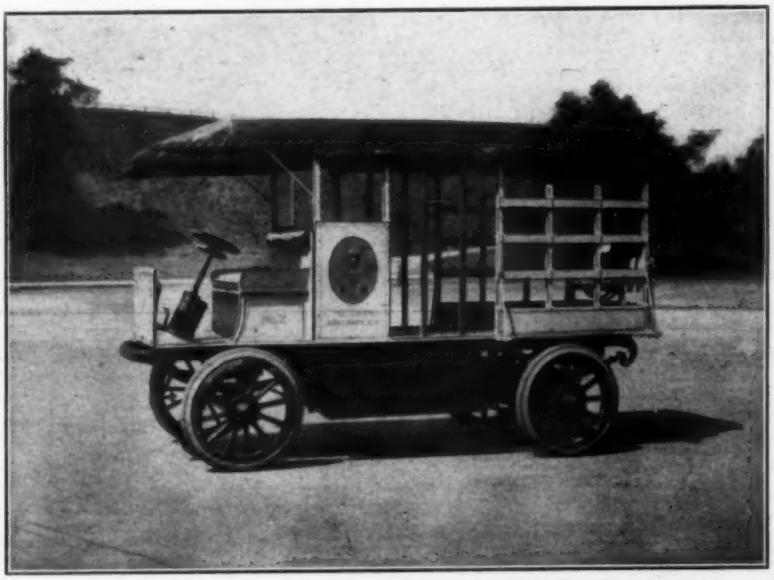
Another test being made at the Show is for the greatest mileage on a single battery charge.

An interesting bit of "Safety First" work has been put in practice by the proprietor of a garage in Louisville, Ky., whose example might well be followed in other places.

Motor vehicles leaving this garage are obliged to cross the sidewalk of a busy street along which pedestrians are passing all hours of the day and night, and as a warning a lamp has been installed in front of the exit in a large globe, on each side of which the word, "Danger" is painted in large letters.

This lamp is lighted from sunset to sunrise and in itself forms an effective cautionary signal. It is, however, supplemented by a loud-ringing gong, which is automatically operated whenever a vehicle approaches the exit door, a steel plate being so placed that it automatically closes the contact with a copper spring and rings the bell whenever the wheels pass over it.

Our correspondent writes that it is interesting to note how pedestrians passing along the sidewalk intuitively "stop, look and listen" at the instant the bell begins to ring and wait until the automobile has crossed the sidewalk into the street. It has been suggested that local authorities would do well to enforce the installation of such a device at the entrance to every garage located on busy thoroughfares.



GENERAL.

Name of Company—Roessler & Hosslacher Chemical Company.

Business — Manufacturing Chemists.	Make of Tires—Firestone (solid).
Capacity of Vehicle—One ton.	Date of Purchase—June 2, 1913.
Approximate Price—$3,575.	Battery—Edison.
Make of Vehicle—Commercial Truck Company of America.	Size of Tires—36x3½.
	Cells—60 A-6.

OPERATING DATA.

Average Daily Mileage—20.	Driver's Salary ,per Month—$58.
Kilowatt-Hours per Month—1,200.	Daily Hours in Use—10.
	Days in Service, per Month—26.
Cost of Electric Power, per Month—$30.	Cost of Repairs and Renewals, Average $30 per Month.

TOTAL AVERAGE MONTHLY OPERATING COST—$120.

Electric Vehicle Luncheon.

The Chicago Section of the Electric Vehicle Association of America resumed its weekly luncheons on Tuesday, October 6, holding a very successful luncheon in the men's grill of Marshall Field's Annex, Chicago. No regular program was provided, the luncheon being merely for the purpose of permitting an interchange of ideas and of promoting good will among the members. O. H. Caldwell gave a short talk on the work being done by the New York Section in regard to the subject of the electric vehicle in parcel-post delivery.

A hearing was held before the Commissioner for Fire Protection of the Metropolitan District of Boston, September 30, on amending the present regulation which forbids the storing of electric and gasoline automobiles in the same garage. Representatives of electric vehicle companies asked that the rule be changed so as to allow the storage of both, providing the charging plug be not less than 4 feet above the floor.

Electrical Construction

ELECTRICAL WORK IN A MODERN TYPE FOUNDRY.

Some Switchboard and Wiring Details.

The new type foundry of Barnhart Brothers and Spindler, Chicago, Ill., has a complete gas-producing plant which supplies gas to type-casting machines, hardening furnaces, machine and brazing torches, lead and slug-casting machines, plating baths, annealers and the engine units generating direct and alternating current for power and lighting purposes. The plant is also provided with central-station service but this is only used at night and in case of breakdown.

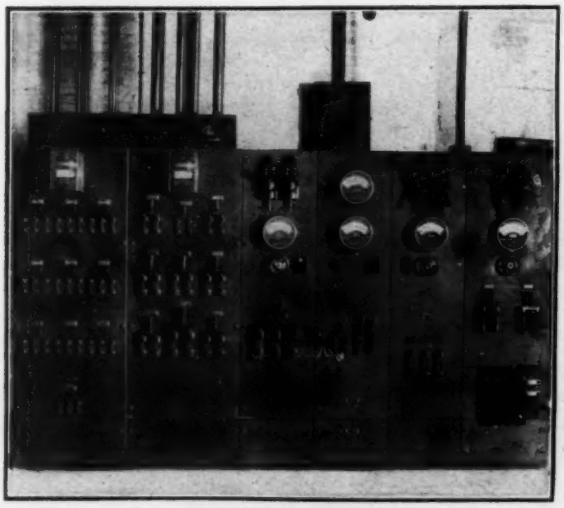


Fig. 1.—Front View of Main Switchboard.

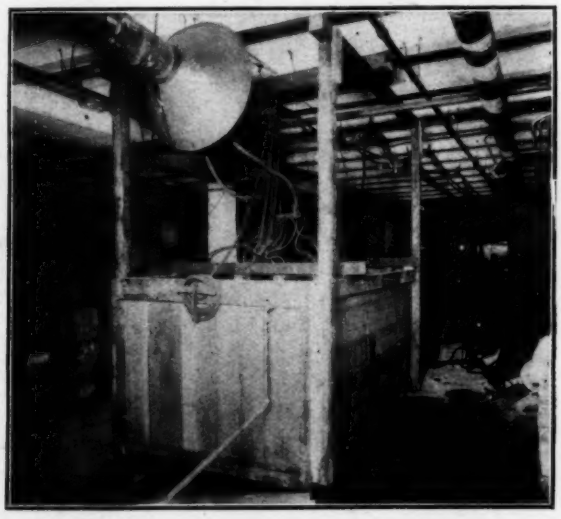


Fig. 2.—Temporary Water Rheostat.

The generating equipment includes one 75-kilowatt, 110-220-volt direct-current Crocker-Wheeler generator driven by an Alberger gas engine and a 150-kilowatt, 110-220-volt direct-current Crocker-Wheeler generator driven by two Alberger gas engines. A 50-ampere, 110-volt Crocker-Wheeler balancer set and a 50-kilowatt, motor-driven, 450-volt, single-phase Thomson welding alternator are also installed. All connections between the generating units and the switchboard are made by cables carried in concrete floor ducts.

Switchboard Details.

Fig. 1 shows a front view of the main switchboard located in the engine room. The switchboard is of 1.5-inch natural black slate and is mounted on four-inch channel irons. It was designed and built by Henry Newgard & Company, Chicago, Ill. Both the main light and power panels are provided with watt-hour meters, that for the lighting service being 110-220-volt, three-wire and that for the power service 220-volt, two-wire. The generator and motor-generator panels are all equipped with Condit oil switches. The panel controlling the circuits for the balancer set is provided with a Weston voltmeter and a Weston ammeter, a voltmeter receptacle and the necessary switches.

All rheostats are mounted on the back of the board as well as the narrow slate fuse panels holding the necessary link fsues. On the wall to the rear of the board are mounted the meters for the central-station night and emergency service, the connections to the main switchboard being made by means of conduit carried on the angle-irons holding the board from the wall.

A pull box is located on the ceiling above the board and one is mounted on top of the board itself as can be seen in Fig. 1. The latter pull box is open at the bottom and permits the wiring of the board to be done in a more systematic and neat manner.

A number of motors are installed throughout the building, condulets being employed at the conduit ends.

Wiring.

The power wiring throughout the building is done in conduit but much of the wiring for light is exposed knob-and-cleat work. Most of the vertical runs of lighting conductors, however, are carried in conduit, the change from conduit to knob-and-cleat work being made near the ceiling where the wires leave the vertical conduit runs through Appleton porcelain fittings.

One of the illustrations shows one of the Thomson welding machines used for chase welding. The one illustrated is supplied through wires carried in conduit which comes up through the floor near the base of the machine to the knife switch. The cables are then run to the welding transformer, fuses and the switch which is located at the top of a vertical iron post and which is operated by means of a foot pedal. Conduit and porcelain fittings are employed to carry the necessary cables up to the foot-operated switch. All conductors that are run exposed are inserted in circular loom.

Throughout the building numerous receptacles are provided for the insertion of attachment plugs for extension lights. Many of the motors employed had to be mounted on the ceiling. When the bases of such motors were

mounted vertically a triangular frame of iron was fastened to the wood beams for the purpose. In order to steady the support to its corners there were fastened iron rods leading to nearby secure supports.

Temporary Water Rheostat.

During some tests that were performed on the power plant a large 250-volt water rheostat was employed.

Fig. 3.—Welding Machine.

The tank of this rheostat was about 5x8x4 feet and was made of wood as can be seen in Fig. 2. Temporary cables were run to it and fastened on wooden connection blocks from which wires were led to the electrodes. Each set of electrodes consisted of four three-inch iron pipes. One set was hung from a fixed pair of cross beams

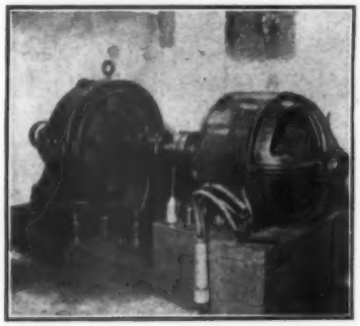


Fig. 4.—Motor-Generator Set.

while the other set was hung from a similar pair attached to a block and tackle.

The power conductors were joined to the pipe electrodes by means of cable lugs. These cable lugs were fastened to the pipes diametrically opposite each other, thereby permitting them and the wires to pass through the space left between the supporting cross beams. These cross beams were connected in such a way that the space between them could be tightened, thus clamping the cable lugs securely and aiding in supporting the pipes.

A continuous flow of water to the rheostat could be maintained by means of a temporary run of pipe as shown. A large ventilator leading to the outair was also provided to carry away the fumes from the rheostat while in operation.

Necessity for Tagging Wires.

I would like to emphasize a fact that many wiremen on first thought would perhaps consider superfluous, namely, the necessity for tagging all wires where they leave a switchboard or other apparatus and go through a wall or down through the floor. A brief notation scribbled on a tag and tied to a wire indicating as fully as the needs would seem to require and as space will permit what wire it is and where it is going, will oftentimes save much time for a trouble-hunter and will greatly reduce the durations of shut-downs in a busy plant.

As a rule, close to a switchboard or any other apparatus it is generally comparatively easy to identify a given wire and to tell where it is going, but at other points and especially amidst a network of wires the operation is more difficult and involved. A few tags in place where they will do the most good facilitates the training of a new engineer or electrician and permits new men to get familiar with a given lay-out in a much shorter time.

L. E. Darling.

THE WIRING OF A THEATER.

A Description of the Electrical Work in the Orpheum Theater, Detroit.

The new Orpheum Theater in Detroit, Mich., is of fireproof construc-

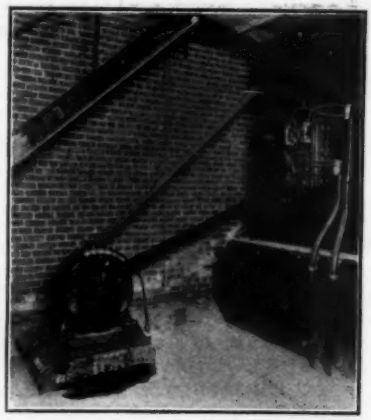


Fig. 1.—Main Blower Installation.

tion throughout. All electrical wires including telephone and annunciator wires are carried in conduit.

Power is obtained from two 110-220-volt direct-current mains connected with the feeders of the Detroit Edison Company. The wiring is designed for a motor capacity of 48 horsepower and for about 2,000 incandescent lamps. An emergency battery is also installed to supply energy to emergency lights in case of failure of power. These emergency lights are all con-

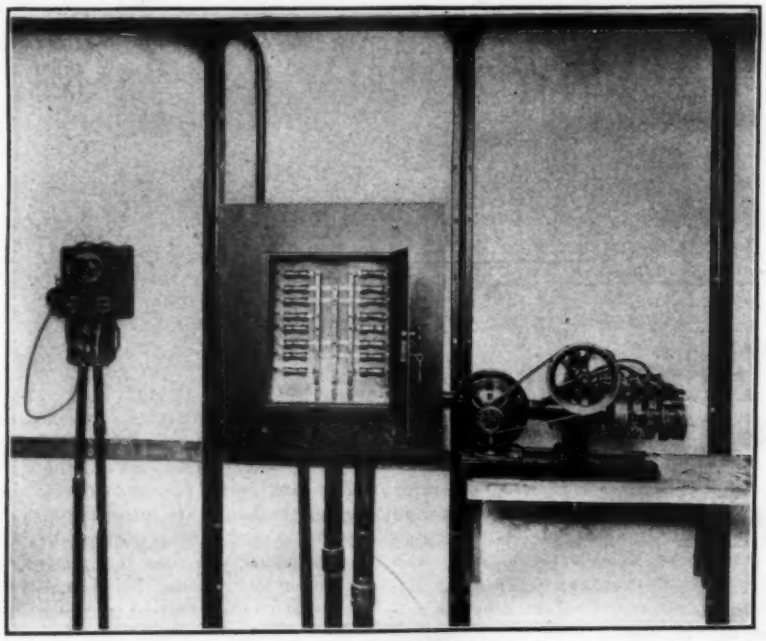


Fig. 2.—Interior of Motion-Picture Booth.

trolled from a cabinet in the ticket booth.

A service switchboard and a stage switchboard are provided. The service board is in the basement and contains the service switches, meters, fuses, etc. This board is mounted on an angle-iron frame and held at the desired distance from the wall by means of rods in which are inserted turnbuckles for the purpose of adjustment.

The motors connected to blower sets, ventilating fans, sprinkler pumps, and vacuum cleaner are located in the basement and are controlled from this board. A set of lighting feeders also leads to a restaurant, located in the basement.

The stage and house feeders are all controlled from the stage switchboard, shown in one of the accompanying illustrations. This board is of slate mounted on an angle-iron frame. Above it is located a large fuse board, as can be seen in the illustration. This board contains the inclosed fuses for the various circuits controlled from the board. At the bottom of the board are located rheostats for the dimming of stage and house lights. These rheostats are mounted vertically a few inches to the rear of the frame of the switchboard panels. At the bottom of the switchboard a separate panel is placed for the control of the rheostats by means of handles.

At the top of the board a pull box is installed as a means for ending the various conduit runs and for permitting the wiring in back of the board to be done in the neatest manner possible.

Stage receptacles, border and strip lights are all controlled from the main stage switchboard. The strip lights consist of General Electric porcelain sign receptacles and lamps mounted in a channel of galvanized iron. Current is supplied to the strip and border lights by means of flexible cables.

The house illumination is a combination of semi-indirect and indirect illumination. The main ceiling fixtures are semi indirect while those on the first floor are indirect.

A motion-picture booth of asbestos-lined galvanized iron is located in the balcony. The circuits in this booth are all carried in conduit. The contact-making device for operating the outside electric sides is located in this booth and wired as shown in one of the illustrations. All switches for the control of the apparatus in the booth are inclosed in small iron cabinets.

A Western Electric Company's intercommunicating telephone connects the booth to the stage. Stations are also located in the box office and other necessary points. All of these circuits as well as those for a return-call annunciator system running to the various dressing rooms are run in conduit. Each dressing room is equipped with a small motor-driven exhaust fan and with special lights mounted on exposed conduit near the mirrors.

Mention has already been made of the flashing signs located on the exterior of the theater, but in addition to these special illumination of the cornice is provided. This cornice is of white terra cotta and is illuminated by means of 570 25-watt Mazda lamps, which are concealed from view and which are supplied by lamps carried in conduit. The lamps, themselves, are held in standard sign receptacles.

On the ground floor of the building are located several stores which are also wired with a concealed conduit installation.

The contact for the electrical work in the theater was awarded to Gray Brothers' Electric Company, Detroit, Mich.

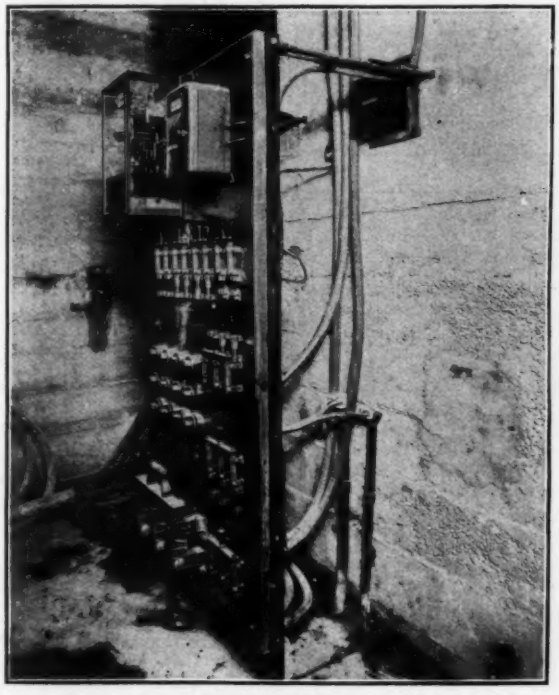


Fig. 3.—Main Service Board.

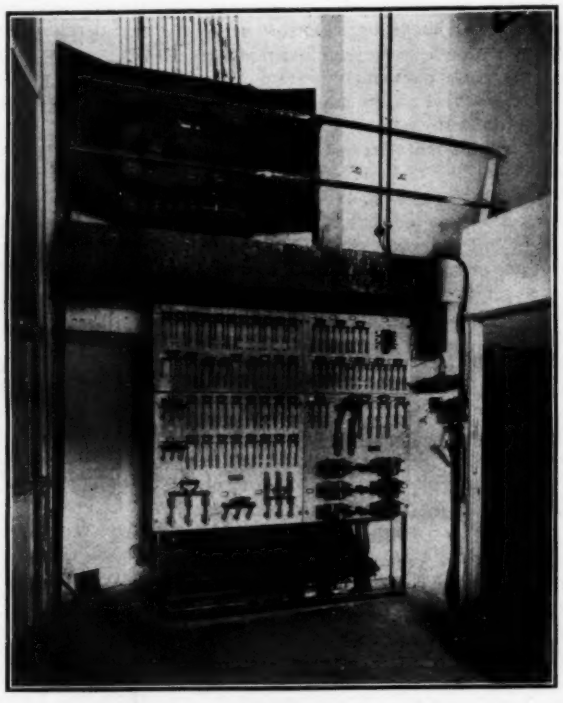


Fig. 4.—Stage Switchboard and Fuse Box.

Successful Handling of Electrical Work for State Fairs.

A satisfactory system of handling temporary installations such as those for exhibitors, side-show men, etc., at the average state fair, has been worked out by C. C. Childers, of Childers & Waters, of Louisville, Ky., and has been followed by that concern for several years with good results and sure profits. The years when the contract for the state fair at Louisville has gone to somebody else, the contractor has failed to make money, while Childers

& Waters uniformly get out with a profit.

One of the secrets, Mr. Childers said, is to keep up with the installations of the exhibitors, keeping them wired up as they come and avoiding unnecessary Sunday work, which means heavy rates for labor. When the fair closes the plan is to get the wires and lamps and other equipment out on the Saturday night the gates of the fair close, so as to avoid dismantling at the Sunday wage rates and so as to make sure that this equipment is returned to the Childers & Waters shop instead of being carried off by exhibitors or others.

Complete installations, the contractor doing all the electrical work from the pole down, were made promptly at this year's Kentucky State Fair, which was held at the fair grounds in Louisville last week. Collections of some 150 accounts were all cleared up on Wednesday and on Saturday night, along about 9 o'clock, the force of the contractor was on hand to dismantle and collect material whenever the exhibitors prepared to take down their tents. There were some 500 lights, yielding the contractor $1.75 each, out of which the fair association got 50 cents. Childers & Waters have been doing the work for several years now and never have had a complaint from an exhibitor to the company or to the fair officials.

Electrical Clearing House of Louisville.

Much serious and purposeful work is ahead of the Electrical Clearing House of Louisville, Ky., for the winter and early spring. The organization, though dating from last March, since when regular meetings have been held, has not heretofore been closely organized, but at the last regular meeting a constitution and by-laws were adopted and steps taken toward mapping out a definite program for the months to come.

Membership in the Clearing House is limited by one of the articles of the constitution adopted, to "individuals, firms or corporations in the electrical contracting business, supply houses and local inspectors, and representatives of the Louisville Gas & Electric Company." Further restrictions provide that one year's experience in business shall be a prima facie requirement to admission to membership, except by a special action of the organization, while actual members who through changes in their businesses cease to remain eligible shall be dropped. There were 46 present at the last meeting, a good turnout considering the number of concerns eligible to membership. Sixty cards are sent out to announce each meeting, though it is expected that this number will be increased in the near future.

The business-like intentions of the organization are indicated in the article of its constitution which reads:

"The object for which the Clearing House is formed are: The fostering of trade among the electrical contractors, to reform abuses and to secure freedom from unlawful and unjust exactions, to settle differences between the members, to promote more enlarged and friendly intercourse between its members and to diffuse accurate and reliable information among its members and a better understanding between contractors and inspectors as to interpretation of the Code."

"Business first" is the purpose of the organization, which will leave the social side to the Jovians. The plans include permanent committees, including a publicity committee, program committee, etc. The aim is to have a set speech at each of the regular monthly meetings, which are held on the second Monday of the month, in addition to the technical subjects that are to be considered. The meeting place, in the offices of the Kentucky Acturial Bureau in the Starks Building, have been equipped with blackboards and speakers and demonstrators will reinforce their talks with diagrams.

The present officers, it has been provided, will hold over until the first annual meeting of the organization, to be held next June. C. C. Childers, of Childers & Waters, contractors, is president; F. G. Burdorf, of the Burdorf-Brecher Company, fixture dealers, is vice-president; and E. C. Knoop, of the Kentucky Acturial Bureau, is secretary and treasurer.

Contractor Conducts Lighting Campaign in Louisville, Ky.

Electrical contractors in Louisville, Ky., and the nearby cities are watching with interest to see what success is met with in the campaign just begun in Louisville by the Paradise Electrical Company, to place a large number of the high-efficiency, nitrogen-filled, 500-watt electric lamps. The advertisements of the company and the solicitors are quoting flat rates for both interior and exterior installations, complete with the suspension outfit on the interiors and with the brackets, etc., on the exteriors. The rate for the interior installation, ready to turn the current on is $12, while that for the outside installation is $14. There are numbers of business houses as well as public assembly places, such as motion-picture theaters, churches, etc., and factories, and other concerns which could use the service and it is expected in Louisville that the campaign will be a successful one.

Among the Contractors.

The contract for the electrical work involved in the new assembling plant of the Ford Motor Car Company, in Cincinnati, O., has been let to A. L. Fink & Company, 2815 Woodburn Avenue. The job will include three electric elevators, which have not yet been purchased. This contract amounts to about $7,800. The Fink firm is also busily engaged on the electrical work in the Lafayette-Bloom School, which amounts to about $13,000.

The Erner-Hopkins Company, of Columbus, O., has just been awarded contract for the electrical work on the new Ford Automobile Company's service building, now being erected at Cleveland. This building, consisting of four stories of concrete and steel, will be almost a duplicate of that lately completed by the Ford Company at Columbus. The electrical work will run about $7,500. The contract requires that it be completed by May 1, 1915. Owing to the fact that the Erner-Hopkins Company were the electrical contractors for the Columbus building, they will have the benefit of experience with respect to this job.

Among recent contracts taken on by the Avery-Loeb Electric Company, Columbus, O., is one from the King Lumber Company, for equipment of the new high school at Elkins, W. Va. Another is the wiring for the Lazarus Block, Columbus, which is to be rebuilt. This is distinct from the Lazarus department-store building, on which the company is also doing work. It will also have the United States Woolen Mills Company's building, Columbus, which is to be reconstructed.

A $4,000 contract has been secured by the McKeever Electric Company, Columbus, O., for the electrical work on a $125,000 high school being erected at Canal Dover, O. Elevators and telephone installation are included. The same concern is the successful bidder for $2,000 worth of work on the new postoffice building at Piqua, O.

The Marsden Electric Company, newly organized with A. B. Marsden as president, has bought the contracting and supply department of the Rutland Railway, Light & Power Company, Rutland, Vt., and is conducting that business with headquarters at 57 Center Street, Rutland. The field operated in by the Rutland central station includes the towns of Fairhaven and Poultney, and the new company's territory comprises these communities as well as Rutland.

The Goshen Stamping and Brass Company, of Goshen, Ind., which has been engaged in a general electrical contracting and jobbing business for five years, has recently been incorporated for $15,000.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

Competition Permitted. The Commission granted a certificate of convenience and necessity to the International Gas Company, permitting it to furnish service in Nogales in competition with the established company, the Nogales Electric Light and Water Company. According to a statement of the Commission the case involved a full consideration of the rights and status of a company desiring to enter a field in which a similar company is already established. It was held that both the existing company and the applicant utility shall be judged as of the date the application was filed.

The existing company does not carry any day load. The applicant company must operate day and night. There is a marked reduction in rates, but the decision is concerned chiefly with the improvement of service.

CALIFORNIA.

The Pacific Light and Power Corporation was authorized to issue $170,000 face value of its first and refunding mortgage bonds to be used in complying with the sinking-fund provisions of its trust deed; 19,430 shares of its first preferred six-per-cent cumulative stock at not less than $85 per share, and $4,382,000 of first and refunding-mortgage bonds at not less than $85 and accrued interest, provided the bond issue be made subsequent to the stock issue. The proceeds shall be used only to reduce the company's floating indebtedness or for additions and betterments, the latter subject to the Commission's approval.

ILLINOIS.

Standards for Gas and Electric Service. Rules establishing standards for gas and electric service, effective November 1, 1914, have been adopted by the Commission. These rules differ from the tentative rules, which were made the basis of the hearing before the Commission, both as to general arrangement and as to requirements in a number of important rules. Upon installation, gas meters are to be adjusted so as to be not more than one per cent in error, and meters in service are to be not more than two per cent in error, when passing gas at six cubic feet per hour per rated light capacity. The monthly average total heating value of gas is to be not less than 565 British thermal units and at any one time the total heating value is to be not less than 530 British thermal units. The requirements of the Wisconsin Commission for heating value are 600 B. t. u. and 550 B. t. u. respectively. The rules for meter-testing equipment, periodic and referee tests, calorimeter equipment, purity of gas, and gas pressure are similar to the requirements of the Wisconsin and other commissions. In the rule for meter-testing equipment for electric utilities, secondary standards are to be maintained by each utility having more than one thousand meters in service. This is usually required of companies having 250 customers. Upon installation electric meters are to have an average error not over 2 per cent and the allowable error for watt-hour meter in service is 4 per cent.

The rule covering the periodic testing of electric meters is as follows:

"Each watt-hour meter shall be tested according to the following schedule while connected in its permanent position in place of service:

"(a). Two and three-wire commutating-type and mercury-type meters, up to and including 50 amperes rated capacity of meter element, shall be tested at least once every 18 months.

"(b) Two and three-wire commutating-type and mercury-type meters of over 50 amperes rated capacity of meter element, shall be tested at least once every 12 months.

"(c) Two and three-wire single-phase induction-type meters, up to and including 25 amperes rated capacity of meter element, shall be tested at least once every 30 months.

"(d) Two or three-wire single-phase induction-type meters of over 25 amperes rated capacity of meter element shall be tested at least once every 24 months.

"(e) Self-contained polyphase meters up to and including 50 kilowatts rated capacity, shall be tested at least once every 18 months.

"(f) Self-contained polyphase meters of over 50 kilowatts rated capacity shall be tested at least once every 12 months.

"(g) Polyphase meters connected through current transformers or current and potential transformers, to circuits up to and including 50 kilowatts rated capacity, shall be tested at least once every 24 months.

"(h) Polyphase meters connected through current transformers or current and potential transformers, to circuits of over 50 kilowatts rated capacity, shall be tested at least once every 18 months."

Other rules apply to voltage variation, voltage surveys and records, and standard frequency for alternating-current service.

All new construction of electric companies are to comply with the rules in the current edition of the National Electrical Code regarding the grounding of secondaries.

The rules for both gas and electric utilities contain rules regarding the extension of service. The rules covering the extension of the lines of electric utilities are as follows:

"(a) **Free Extensions.** Each utility shall upon written request for service by a prospective consumer or a group of prospective consumers located in the same neighborhood make free of charge a line extension necessary to give service and furnish free service connection, provided that such line extension does not require more than twice as many poles at standard spacing as there are individual applicants.

"(b) **Extensions Above Free Limit.** If the line extension required in order to furnish service at any point within the corporate limits of any city or village, or for any adjacent suburb of a city or village is greater than the free extension specified above, such an extension shall be made under the following conditions. The utility may require a deposit of the cost of extension above the free limit and shall, in such case, refund an amount equal to the cost of the free main extension for each additional consumer whose service shall be taken off of the entire extension within a period of ten years from the making of such an extension, but at no time shall the rebate made exceed the original deposit. If the extension is of such length and the prospective business which may be developed by it is so meager as to make it doubtful whether the business from the extension would ever pay a fair return on the investment, the fact shall be report-

ed to the Commission for investigation and determination as to the reasonableness of such extension.

"This rule shall not be construed as prohibiting any utility from making free extensions of lengths greater than above specified, or from providing a method of return of deposits for extensions more favorable to consumers so long as no discrimination is practiced between consumers whose service requirements are similar.

"(c) **Contract for Service.** Utilities will not be required to make line extensions as described in this rule unless those to be served by such extensions shall contract to use the service for at least one year."

INDIANA.

The Merchants' Heat and Light Company was authorized to issue $75,000 of bonds. The company's application was for $103,000 but the Commission refused to authorize the other $28,000 on the ground that it represented duplication of the existing lines or plant of the Indianapolis Light and Heat Company. Such a holding in regard to duplicate facilities will have an important bearing on the controversy concerning the street-lighting contract, now before the Commission. Because of its importance in this respect the decision will be appealed to the court. The Merchant Company also alleges that the entire issue of bonds is necessary to enable the company to comply with the terms of its street-lighting contract with the city.

The Indianapolis Light and Heat Company has entered into an agreement to let the Commission regulate its rates and service, regardless of franchise rights, to the same extent as if it were operating under an indeterminate permit. It appears that if the Commission should demand the surrender of the company's franchise, it would stop the payment to the city of approximately $75,000 annually, which loss under he present financial conditions affecting the city would be embarrassing to the city.

MARYLAND.

Valuation of Public-Utility Property. It is the plan of the Commission to require a valuation of the property of the public utilities within the state. Uniform appraisal forms are being prepared so that every valuation submitted to the Commission will be in the same form to facilitate the arrangement and comparison of the data required.

NEW JERSEY.

The Annual Report has been issued for the year 1913.

NEW YORK—Second District.

The Niagara, Lockport and Ontario Power Company was authorized to issue $800,000 two-year secured six-percent gold notes, to be sold at not less than 95, the proceeds, with $140,000 from other sources, to be used to take up the one-year gold notes issued a year ago, by the company.

RHODE ISLAND.

Electrolysis. The Commission has prepared a report of the detailed survey of the electrolysis situation in Providence. The survey completed by the Commission included an examination of the Rhode Island Company's tracks, the Providence Telephone Company's underground cables and conduits, the Narragansett Electric Lighting Company's underground wires, all gas mains and all water mains.

WASHINGTON.

Telephone Companies in the state have been ordered to show cause why rules should not be adopted by the Commission prohibiting any advance collections by the companies except for messages at pay stations and the payment of one month in advance by regular subscribers, and also to show cause why deposits for installation charges now held by them should not be returned to the depositors.

WISCONSIN.

The West Menasha Telephone Company was granted an adjustment of rates upon its own application. The order provides for the establishment of a rate of $15 per telephone per year.

The Norwalk Independent Telephone Company was granted permission to increase its rates.

Commission Regulation Discussed at Pittsburgh.

The Public Utilities Commission of Pennsylvania, its functions and its relation to public service corporations and the general public, was explained by Professor Knowles of the University of Pittsburgh at a recent banquet of the Duquesne Light Company Section of the National Electric Light Association, at Kaufmann's Restaurant, Pittsburgh, Pa. Professor Knowles described the conditions brought about by the increase in large industrial combinations and pointed out that regulation was the only solution of the problem. The "death struggle" competition, he said, instead of bettering service to the public, only prevents better conditions and puts added burden on the shoulders of the consumer. He said that corporations of today realize that public opinion is but the combined opinion of individuals, and that they are therefore straining every effort to put their case before the public as the jury which will give final judgment on the matter. Publicity is the keynote of modern business, and in this lies the opportunity for a better understanding between the corporation and the public which will eventually result in better service. The commission, he said, will go a long way toward wiping out municipal corruption.

Conflicts Between State Commissions and Federal Courts.

CALIFORNIA.—Attorney General Webb, of California, and the State Railroad Commission were enjoined on September 14 by Federal Judge Maurice T. Dooling at San Francisco from enforcing a state law declaring pipe-line companies to be common carriers, and requiring them to file their rates with the Commission.

ILLINOIS.—Federal Judge Kohlsaat in Chicago has enjoined the Public Utilities Commission from proceeding with a suit to compel the Chicago and Oak Park Elevated Railway to obey an order previously issued for elevating that portion of its track which is now on the surface, or to collect a fine for non-compliance. The commission had instituted suit in the Superior Court of Cook County. The company is in the hands of a receiver appointed by the federal court, and the court has directed the receiver to issue receiver's certificates to secure the necessary capital and to proceed with the elevation work.

On account of numerous accidents and loss of life, the village of Oak Park has for some time endeavored to secure elevation, and a contract to this end was accepted about two years ago by the company, then already in the hands of a receiver. During the present year the state utilities commission also ordered elevation, with the alternative of changes in operating rules insuring greater safety. The receiver not only secured an injunction against the enforcement by the village of an ordinance providing for greater safety, but has now nullified the authority of the state utilities commission by the same method.

Public Utilities Commission for Maine.

An act to create a commission to supervise and regulate all the public utility companies of Maine was accepted by vote of the people of the state at the election last week, the majority in favor being about two to one against. The measure was enacted by the Legislature a year ago, but was suspended under the terms of the Maine referendum law. The act becomes effective upon the proclamation of the Governor.

Among the Supply Men

The Electric Appliance Company's Picnic.

The first annual outing of the Electric Appliance Company, Chicago, was held September 19, at Hudson Lake, Ind. A special train left Chicago at 9:15 and carried over two hundred, including W. W. Low, president, Mrs. W. W. Low and T. I. Stacey, secretary and treasurer.

A basket lunch was served in the beautiful picnic grove immediately upon arrival at 12:15. The athletic program started promptly at 1:30 p. m. There were sprints and contests of all kinds for men, women, girls and boys, and handsome prizes awarded to the winners. The matrons' race was a spirited one, the prize being a "Eureka" vacuum cleaner. Great amusement was derived from the sack-race, three-legged race, needle-threading contest and the plump ladies' race.

A baseball game was the last event on the program. This was between Wattling's "High-Brows" and Bourne's "Shamrocks," and the result was 15 to 13 in favor of the latter.

At 6 o'clock a chicken dinner was served at Smith's Hotel. After dinner there was music, dancing and boating until train time.

The special train left at 8 p. m. for Chicago and a vote of thanks was given for the good time.

The prize winners were as follows:

Boys' Ball Throw—Philip Misner, 1st; D. Lempke, 2nd.

Girls' Ball Throw—Marie McDonald, 1st; Margaret Lempke, 2nd.

Children's Potato Race—Lillian Sup, 1st; Ray Le Jeune, 2nd.

Boys' Sack Race—James Johnston, 1st; Louis Misner, 2nd; Ernest Kuenipel, 3rd.

Boys' Potato Race—M. Alderson, 1st; G. Hennessy, 2nd; Peter Lermatt, 3rd.

Girls' Potato Race—Miss Violet Gerharz, 1st; Emma Gerharz, 2nd; Annabell Stone, 3rd.

Plump Ladies' Race—Miss Carrie Berman, 1st; Marjorie Hansen, 2nd; Florence Thies, 3rd.

Matrons' Race—Mrs. S. J. Beggs, 1st; Mrs. Henry Hawley, 2nd; Mrs. Adrian Scheltes, 3rd.

Girls' Race—Ethyl Taylor, 1st; Alice Stock, 2nd; Alice Kennedy, 3rd.

Girls' Race—Mary McDonald, 1st; Lillian Silhanek, 2nd; Violet Gerharz, 3rd.

Men's 100-Yard Race—Charles Peterson, 1st; Charles Johnson, 2nd; Norman Michelson, 3rd.

Boys' Three-Legged Race—John Evenhause and Henry Zudyk, 1st; Philip Misner and Teddy Le Jeune, 2nd.

Men's Three-Legged Race—E. Werlein and S. Smith, 1st; F. Hallman and A. Pederson, 2nd.

Ladies' Egg Race—Miss Ethyl Taylor, 1st; Mrs. Peterson, 2nd; Mrs. Fries, 3rd.

Ladies' Needle Threading Race—Mrs. Sup, 1st; Mrs. Hawley, 2nd; Miss Alice Kennedy, 3rd.

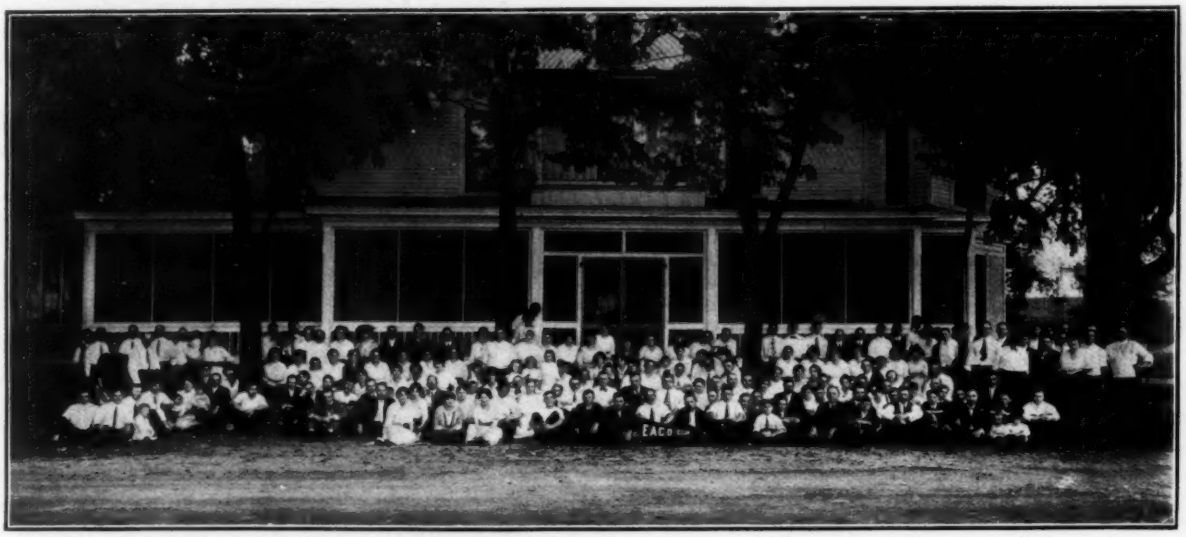
Ladies' Ball Throw—Miss Annabel Stone, 1st; Miss Emma Gerharz, 2nd; Miss Carrie Berman, 3rd.

Fat Men's Race (165 pounds)—Frank Hallman, 1st; A. F. Blesse, 2nd; Charles Sup, 3rd.

Fat Men's Race (185 pounds and over)—Mr. Higgins, 1st; R. S. Mitten, 2nd; F. L. Dennis, 3rd.

Children's Guessing Contest—Philip Misner, 1st; George Hennessy, 2nd; Ernest Kuempel, 3rd.

Adults' Guessing Contest—Mrs. MacDonald, 1st; Bernard Tesch, 2nd; Mr. Gutenson, 3rd.



Group at Picnic of Electric Appliance Company.

New Plant in Venice.

The company supplying hydroelectric power to Venice and the surrounding province of Venetia, Italy, is building a new plant near Belluno to utilize the waters from Santa Croee and Morto Lakes. It plans to widen its zone of operations in Italy and to extend it even into Austria.

An American consul at Seoul, Korea, states operation has been begun in the rich tungsten mines in the eastern part of Chosen. The estimated value of the ore is $400 per ton.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 5.

Energy is transmitted from a switchboard to a lamp and motor load as shown in Fig. 4.

Two No. 1 wires each 600 feet in length connect the load to the switchboard. The parallel-connected group of lamps takes 20 amperes from the line wires, while the motor connected in parallel with the lamps takes 30 amperes from the line wires. The voltage between the line wires at the switchboard is maintained constant at 125 volts.

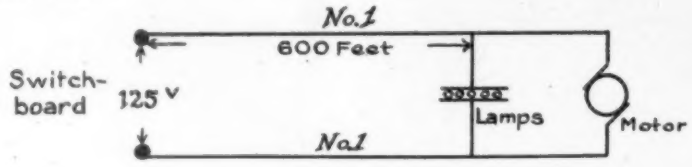


Fig. 4.

Find (*a*) the power supplied to the lamps, (*b*) the power supplied to the motor, (*c*) the power lost in the line, (*d*) the total power taken from the switchboard, (*e*) the efficiency of transmission, (*f*) the energy taken from the switchboard in 8 hours, and (*g*) the cost of the energy supplied to the system in 8 hours if a kilowatt-hour costs 10 cents.

SOLUTION OF PROBLEM 5.

The current (I), flowing in the line wires is given by [13]

$$I=20+30=50 \text{ amperes.}$$

The resistance of 1,000 feet of No. 1 wire (from the wire table), is 0.129 ohm. Since the circuit contains 1,200 feet of line wire, the total resistance of the line is 1.2×0.129 or 0.155 ohm. The resistance voltage (V_R) in the line is then given by [4]

$$V_R=-50\times0.155=-7.75 \text{ volts.}$$

The voltage at the switchboard being 125 volts, the voltage, at the lamps (or at the motor), is given by [5]

$$V=125-7.75=117.25 \text{ volts.}$$

The power (P) supplied to or from any section of an electric circuit is given by [19]

$$P=VI \text{ watts,}$$

where (V) is the potential difference between the ends of and (I) is the current flowing in the section in question. When the potential difference (V) is a potential drop in the direction of the current flow, power is supplied to the section, and when (V) is a potential rise in the direction of the current flow, power is supplied *from* the section.

Answer to Question a.

The power (P) supplied to the group of lamps is given by [19]

$$P=117.25\times20=2,345 \text{ watts.}$$

Answer to Question b.

The power P supplied to the motor is given by [19]

$$P=117.25\times30=3,517 \text{ watts.}$$

When any section of an electric circuit contains no source of emf., the power (P) supplied to that section is also give by [20]

$$P=I^2R \text{ watts,}$$

where (I) is the current flowing in and (R) is the resistance between the ends of the section in question. In this case, the power (P) is always supplied *to* the section and is converted into heat.

Answer to Question c.

The power (P) lost in the line is given by [20]

$$P=50^2\times0.155=388 \text{ watts.}$$

It should be noted that this power loss might also have been calculated by [19]

$$P=7.75\times50=388 \text{ watts.}$$

Answer to Question d.

The total power taken from the switch-board is given by [19]

$$P=125\times50=6,250 \text{ watts.}$$

This result may be checked by the fact that the total power supplied to the circuit must equal the sum of the powers supplied to each section. Thus, $P=2,345+3,517+388=6,250$ watts.

When a large number of figures is required to express the power, it is customary to use a larger unit of power called a kilowatt. One kilowatt equals 1,000 watts. Thus the total power supplied to the circuit may be expressed as 6.25 kilowatts.

The ratio of the power (P_L) received at the load to the total power (P_s) supplied to the load and line wires is called the efficiency (e) of the transmission line. Hence [21]

$$e=P_L/P_s$$

Since $P_L=I_sV_L$ and $P_s=I_sV_s$, [21] may be written

$$e=I_sV_L/I_sV_s=V_L/V_s$$

Answer to Question e.

The power (P_L) supplied to the load equals $2,345+3,517=5,862$ watts. Hence by [21]

$$e=5,862/6,250=93.8 \text{ per cent.}$$

The energy (W) supplied to or from

ALTERNATING CURRENTS.

Problem 55.

A certain part of a manufacturing plant which requires power for both lighting and single-phase motors is supplied over a separate line from the power house. In order that the voltage at the load may be kept constant without affecting any other circuit, this line is supplied with power by an independent single-phase alternator. The calculated resistance and reactance of the line of 60 cycles are 0.0128 ohm and 0.0131 ohm respectively. The lighting load consists of incandescent lamps which take 30 kilowatts at their rated voltage, viz., 110 volts. The single-phase motors take 45 kilowatts at the same voltage and operate at 92 per cent power-factor. This motor load is on continuously but the lighting load begins at four o'clock. (*a*) What is the total current supplied after four o'clock; (*b*) what is the resultant power-factor of the lighting and power loads at this time; (*c*) if the terminal voltage of the alternator is adjusted so that the voltage at the load is maintained constant at 110 volts, what are its values before and after four o'clock; (*d*) at what power-factor does the alternator operate after four o'clock?

any section of an electric circuit is given by [22]

$W=IVH/1{,}000$ kilowatt-hours,

where (I) and (V) have the same meaning as that given in [19] and (H) equals the number of hours that the constant power (IV) is supplied. The energy (W) is also given by [23]

$W=I^2RH/1{,}000$ kilowatt-hours,

under the conditions outlined in [20].

Answer to Question f.

The total energy taken from the switch-board in eight hours is given by [22]

$W=125\times50\times8/1{,}000=50.0$ kilowatt-hours.

The energy supplied to such a system in any given time is actually measured by a watt-hour meter.

Answer to Question g.

The cost of 50 kilowatt-hours at 10 cents per kilowatt-hour equals $5.00.

SOLUTION OF PROBLEM 55.

In Problem 2 it was shown how to add alternating voltages by using resistances and reactances, and in Problem 4 the method of vector addition was applied. In Problem 3 it was shown how alternating currents may be combined by using conductances and susceptances. The present problem illustrates the method of vector addition as applied to this combination of alternating currents. Both of these methods for adding alternating currents and voltages are used in practice. Sometimes one of them is preferable to the other in the point of time required for the solution. Experience is the only guide. Both methods, of course, give the same final results.

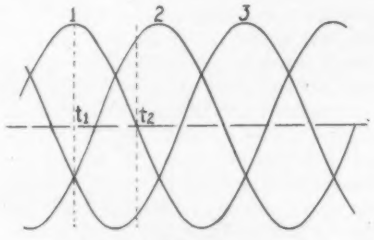


Fig. 5a.

Answer to Question a.

The current taken by the incandescent lamps, since they operate at unit power factor is, by [1a]

$I_1=30{,}000/110,$

$=273$ amperes.

The current taken by the single-phase motors is; by [1a]

$I_2=45{,}000/110\times0.92,$

$=445$ amperes.

The method of vector addition of alternating currents is exactly the same as that for the addition of alternating voltages. See Problem 4. Formulas [18a] to [21a] will apply to currents if we change the letter E to I, in which case they become:

[25a] $I_o=\sqrt{I_1^2+I_2^2+2I_1I_2\ Cos\ \Theta}$

The sum of the two alternating currents (I_1) and (I_2) which are displaced in phase by an angle (Θ) is equal to (I_o).

[26a] $\begin{cases} I_h=I_h'+I_h''+\ \ldots \\ I_v=I_v'+I_v''+\ \ldots \end{cases}$

The sum of the horizontal components (I_h') and (I_h''), of the two alternating currents, along some chosen axis, is equal to the horizontal component of the sum of the two alternating currents (I') and (I'') along the same axis. A like statement holds for the vertical components.

[27a] $I=\sqrt{I_h^2+I_v^2}$

The actual current is equal to the square root of the sum of the squares of the horizontal and vertical components.

[28a] $Cos\ \phi=I_h/I.$

The cosine of the angle that the actual current makes with the chosen axis is equal to the horizontal component along the axis divided by the actual current.

In order to find the sum of these two currents choose the axis of reference along the voltage at the load, viz. 110 volts.

Since the first current is in phase with this voltage

$I_h'=273$ amperes

$I_v'=0$

The cosine of the angle of phase displacement of the second current and this voltage is 0.92. The sine of the angle may be found from tables or from the fact that $\sin\phi=\sqrt{1-Cos^2\phi}$; $\sin\phi''=\sqrt{1-0.92^2}=0.391$.

$I_h''=0.92\times445=410$ amperes.

$I_v''=0.391\times445=174$ amperes.

By [26a] $I_h=273+410,$

$=683$ amperes

$I_v=0+174,$

$=174$ amperes.

The line current at this time is, by [27a]

$I=\sqrt{683^2+174^2}$

$=705$ amperes.

Answer to Question b.

The cosine of the angle of phase displacement of the resultant current and the chosen axis, which in this case is the voltage at the load, is by [28a]

$Cos\ \phi=683/705$

$=0.969.$

Power-factor$=0.969.$

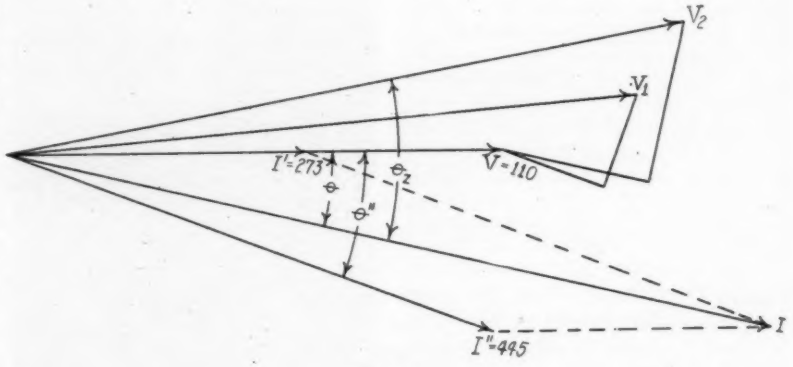


Fig. 6a.

Answer to Question c.

We have now to find the sum of the voltage at the load and the line drop. (See Fig. 6a). Before four o'clock the line current is that supplied to the motors; viz., 445 amperes. In this case we will choose this current as the axis. The horizontal and vertical components of the load voltage with respect to this axis are:

$V_h=0.92\times110=101$ volts.

$V_v=0.391\times110=43$ volts.

By [22a], Resistance drop $=0.0128\times445,$

$=5.7$ volts.

By [23a], Reactance drop $=0.0131\times445,$

$=5.8$ volts.

By [19a], $(V_1)_h=101+5.7,$

$=106.7$ volts.

$(V_1)_v=43+5.8,$

$=48.8$ volts.

By [20a], $V_1=\sqrt{106.7^2+48.8^2}$

$=117.3$ volts.

This is the necessary terminal voltage of the alternator before four o'clock.

After four o'clock the line current (I) [see Fig. 6a] is 705 amperes, and in this case it will be chosen as the axis of reference. With this axis we have:

$V_h=0.969\times110=106.5$ volts.

$V_v=\sqrt{1-0.969^2}\times110=27.0$ volts.

Observe that with the change in the axis the horizontal and vertical components are changed also.

By [22a], Resistance drop $=705\times0.0128.$

$=9.0$ volts.

By [23a], Reactance drop $=705\times0.0131,$

$=9.2$ volts.

By [19a], $(V_2)_h=106.5\times9.0,$

$=115.5$ volts.

$(V_2)_v=27+9.2,$

$=36.2$ volts.

By [20a], $V_2=\sqrt{115.5^2+36.2^2}$

$=121.2$ volts.

This is the necessary terminal voltage of the alternator after four o'clock.

Answer to Question d.

By [21a], $Cos\ \phi_2=115.5/121.2$

$=0.953.$

DIRECT CURRENTS.

Problem 6.

Power may be transmitted to a lamp load from a three-wire source of supply by a two-wire system as shown in Fig. 5 or by a three-wire system as shown in Fig. 6. Given (1) that the lamp load in either case consists of 40 lamps, each taking 50 watts at 112 volts, and connected as shown in Fig. 5 and Fig. 6; (2) that

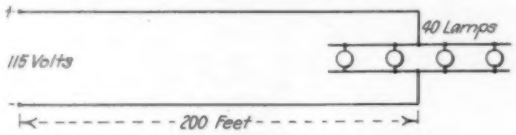


Fig. 5.

the voltage between the line wires in the two-wire system and the voltage between either outside wire and the neutral of the three-wire system equals 115 volts and is maintained constant; (3) that the distance of the lamp load from the three-wire source of supply is 200 feet in either case, and (4) that the power is to be transmitted from the three-wire source of supply to the load at an efficiency of 97 per cent.

Find (*a*) the minimum weight of copper wire required for (1)

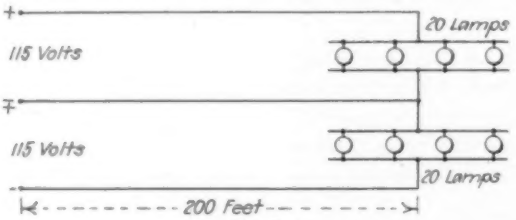


Fig. 6.

the two-wire system; (2) the three-wire system; (*b*) the voltage at the lamps for this minimum weight of copper wire (1) in the two-wire system; (2) in the three-wire system; and (*c*) the ratio of the weight of wire required in the three-wire system to that required in the two-wire system.

This problem is given to illustrate the application of the principles stated in the previous problems to the two-wire and the three-wire systems of distribution.

ALTERNATING CURRENTS.

Problem 56, Part I.

Three similar single-phase motors, each of which takes 20 kilowatts at 0.91 power-factor, are connected in delta across the mains of a 220-volt, three-phase circuit. (*a*) What is the total power supplied? (*b*) What is the line current? (*c*) What is the phase displacement of the line current and the current taken by a motor?

Part II.

Three similar single-phase motors, each of which takes 20 kilowatts at 0.91 power factor, are connected in Y between the mains and neutral conductor of a 220-volt, three-phase circuit. (*d*) What is the total power supplied? (*e*) What is the voltage across each motor, if these voltages are equal? (*f*) What is the phase displacement of the line voltage and the voltage across a motor? (*g*) What is the current in the neutral conductor? (*h*) Compare the equivalent resistance and reactance of each motor load in parts I and II.

This problem illustrates the current and voltage relations existing in balanced three-phase loads.

The angle (ϕ_2) is between the voltage at the alternator and the axis of reference, which in this case is the line current. The angle is thus the phase displacement of the terminal voltage of the alternator and the current.

Power-factor = 0.953.

LETTER TO THE EDITOR.

The Reciprocal Obligation of Employer and Employee.

To the Editor:

Among the excellent and timely remarks made by Mr. Gray before the Chicago Jovian League and reported in a recent issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, he says: "Just about now a man with a good job shouldn't get fresh." The suggestion and advice were valuable and set me thinking in another direction.

I am both an employee and an employer. I know you are right so far as employees are concerned. I also believe that the employer should not get "fresh" unless he is indifferent to the loss of employees that cannot be replaced without difficulty and to whom he is under no obligations. Competitors are always willing and sometimes eager to employ men of reputation, thereby turning the strength and value against the source that has helped to create and maintain them. There is no condition in business that eliminates the attractions of a man of reputation and ability. His compensation and consideration should not be based on sins of omission or commission that he may be guilty of in any one day, but on his average reliability, loyalty and general worth. There is no profit in labor whether it's with the shovel, the pen, or the mind. If the employee does not share in the profits he should not be asked to share in the losses. If he has to bear with the moods and eccentricities of the employer, then he is entitled to toleration for his own vagaries, always provided that in both cases they are within respect and reason.

We hear lots about the loyalty due to employers but we don't hear so much about the loyalty due the employees. The employer who expects loyalty should give it. The employer who wants his employees' efforts always up to the mark will see to it that his compensation is always up to the mark and the consideration given the employee should be always as great as expected by the employer.

Good men, regardless of their title, should never be "fresh." They should never be falsely independent nor intolerant of another's personal or business rights. They should put themselves in each other's places, so that their conclusions may be in balance.

T. C. RINGGOLD,
Central Electric Company.

Chicago, October 6, 1914.

Thirty-fifth Anniversary of Electric Lighting by Incandescent Lamps.

October 21 of this year will commemorate the thirty-fifth anniversary of the invention of the electric incandescent lamp by Thomas A. Edison. This day in 1879 may be said to mark the birth of the general and popular use of electric lamps. Arc lamps had been in use some years previous to this time; but only a few of these were then employed for searchlights, to light theaters, parks, street corners and similar public places. The universal lighting of both public and private buildings of all kinds by electricity through small units remained a dream until realized after Edison first successfully made his bulb glow in his laboratory at Menlo Park, N. J.

So great have been the benefits to mankind from the general employment of electric illumination that Edison may well be acclaimed not only one of the world's most wonderful inventors but also one of her greatest humanitarians. It is therefore an entirely fitting tribute to the genius of the man that October 21 this year should be celebrated both by the industrial world and the general public as a national anniversary. It is particularly appropriate that this day, which will be known as "Edison Day," should be observed at this time in this country as a signal example of the triumph of peaceful constructive achievement in contrast with the present colossal destructive movements against civilization and her pursuits in the Old World.

The announcement of Edison's first lamp appeared in the New York *Herald* on December 21, 1879, two months to a day after its invention. It offers a striking contrast to advertising 35 years afterwards. It ran as follows:

"Edison's discovery of a substance upon which electricity could produce the light of incandescence with comparative inexpensiveness and perfect effect is one of those little romances with which the pathway to every great invention is strewed. We are rejoiced to congratulate not merely Edison, but the people of all civilized nations upon Edison's success."

Dr. C. P. Steinmetz, the chief consulting engineer of the General Electric Company, in giving the essence of his appreciation of Mr. Edison in honor of this anniversary of his invention of the incandescent lamp, said:

"The first time I met Edison was in 1893, at the International Electrical Congress in Chicago. Mr. Rudolf Eickemeyer introduced me to him, and Edison, jokingly pointing at me said, 'Pure theory;' pointing at Eickemeyer, 'Theory and practice,' and at himself, 'Pure practice.' This is the attitude Edison has always taken, declaring himself a mere practical man. The newspaper men have expanded on this and so created the popular belief that Edison does not know anything about theory and science, but merely experiments and tries everything he or anybody else can think of. There is nothing more untrue than this, and Edison probably never made an experiment or tried something where he did not have a good theoretical reason that would justify the trial even from a strictly scientific standpoint.

"It is true, Edison never went to any college—but he knows more about the subjects taught in colleges than most college men. He is essentially a practical man, in the sense that whatever he undertakes he wishes to know whether and how it will be of use and benefit to mankind; but at the same time he is apparently interested and

Thomas A. Edison, Inventor of the Edison Incandescent Electric Lamps.

familiar with almost any field of human knowledge. Whether you talk with him about electrical engineering or other engineering, organic chemistry or anthropology, or any other subject, you always find him fully familiar with the subject and able to give you valuable hints solving your difficulties, as I have found more than once during the various times I had the pleasure to meet him, and that even in the highly theoretical aspects of the subject. Thus, for instance, most electrical engineers now consider the subject of transients one of the most recently explored and most intricate fields of electrical engineering; but already in his first direct-current installation Edison met such phenomena, and understood and explained them. From my experience I consider Edison today as the man best informed in all fields of human knowledge."

Waldemar Kaempffert, editor of the *Scientific American*, also pays tribute gratefully to Mr. Edison on this occasion. "His work, and particularly the invention of the electric incandescent lamp, must forever remain an inspiration to mankind. The long weeks and months of tedious experimenting, the dauntless patience that bravely struggled on after each momentary defeat, and the resourcefulness that turned even failure to account, have perhaps never been equalled and certainly never surpassed in the history of human achievement. No wonder that this man enriched his time with one of its most precious inventions, the Edison lamp, with a form of illumination so wonderfully cheap and efficient that it has enabled the teacher and printer to extend the influence of civilization where it has never been felt before."

It is not necessary now to review the life of Edison, his early inventive bent and characteristic perseverance in the face of severe obstacles. The events connected with the invention of the electric incandescent lamp are especially interesting at present. It was but one of the many incidents in the strenuous days of Edison's life at that time. The world had become familiar already with the big arc lamp and was using it in a few places, but it wanted a light that could be used indoors in small units, comparable with wax and tallow candles, gas jets and the oil lamp. That electricity could furnish such a lamp had been believed for many years by inventors in this country and abroad, but it was not forthcoming. When Edison, fresh from his great successes in the quadruplex telegraph, the telephone transmitter and the phonograph, threw himself on the problem that had practically been abandoned as hopeless, there was limitless skepticism, derision and opposition.

Work went on incessantly day and night in 1878 and 1879. Not only was the struggle within the laboratory intense, but soon there came the ransacking of the world for the right material that should make the incandescent lamp a feasible, profitable commercial proposition. Edison tried the various metals, including those now the main reliance of the art. All kinds of paste were tried as bases for dependable carbon filament in the little bulb of glass; also cotton thread, paper and anything that would carbonize readily and hang together as a filament when the electric current was turned on to it. He came at last to bamboo for the filamentary material. To most of us, bamboo is just plain bamboo; but to Edison, the word opened up an infinite variety. Not only did Edison get all the bamboo he could

secure from the palm-leaf fan up to fishing rods, but he gutted the terrestrial sphere of its supplies.

For nearly ten years the Edison lamp was made with bamboo filaments; and to that lamp must be attributed in a large degree the marvelous development of electric lighting and power all over the world, as well as the creation of the modern central-station industry, which in the United States alone represents an investment of over $2,500,000,000 and annual earnings of over $350,000,000. Even as late as 1908, a few special types of Edison bamboo lamps were being made. But Edison himself did not regard the bamboo lamps as the "last word." Paralleling the carbon-filament lamps of bamboo, there soon appeared the "squirted" filament, employing carbonized cellulose in one form or another, and a great many lamps for a number of years were of that type. Another advance was embodied in lamps, still of the carbon type, in which the filaments were strengthened by such substances as would justify calling them "metallized." The mere word was a revelation as to the direction in which the art was tending, and very quickly metallic filaments were on the market and available to the public. In particular, the metal tantalum seemed to disengage itself from the rest of the group and was found useful in many ways, but it was never more than a half-hearted competitor with the old carbon lamp. Yet all the immense amount of investigation in the field of rare metals capable of giving higher and intenser illumination was bound to yield a result, if improvement actually lay along that line. The way out was soon found in tungsten, a metal tried as far back as the earlier days of Edison, but not then available under the practical conditions of its production and use.

The introduction and general adoption of the tungsten lamp has been literally nothing short of a revolution in the art of interior illumination, with a correspondingly tremendous effect on exterior lighting. Working down from

Charles P. Steinmetz, Chief Consulting Engineer of General Electric Company, Who Pays a Genuine Tribute to Edison in This Article.

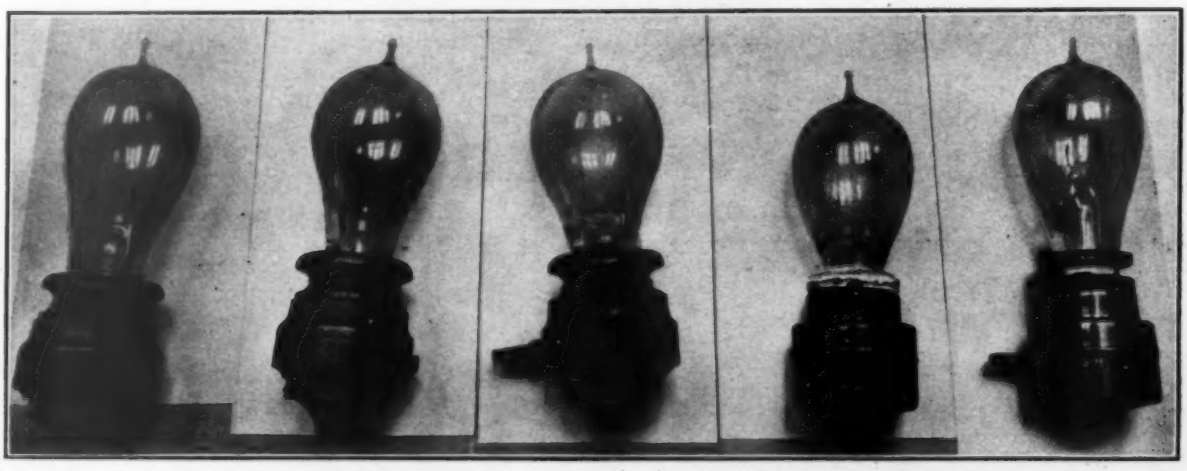
a consumption of 4 or 5 watts per candlepower in Edison carbon-filament lamps to the standard a few years ago of 3.1 watts per candlepower, the tungsten lamp has brought that down in about five years to 1.25 and 1 watt while in the larger sizes of gas-filled tungsten lamps, the reduction in power consumption has reached the low point of 0.5 watt per candle.

Because the electric incandescent lamp is both a scientific and an industrial achievement in its development and perfection, as well as an invention that has proved to be of such manifold utility in increasing the comforts of humanity, it is but natural that those actively engaged in the manufacture and distribution of Edison Mazda lamps should participate in making Edison Day one of the red-letter days in the lighting industry. The Edison Lamp Works of General Electric Company has therefore launched, coincident with the anniversary, the most complete and comprehensive campaign for the purpose of popularizing electric lighting ever undertaken.

The scope of the propaganda is nation-wide and embraces nearly every avenue of public appeal. The manufacturers of Edizon Mazda lamps are co-operating with the lighting companies and dealers to bring before the public on and preceding Edison Day many interesting features in connection with the development of the electric incandescent lamp by Edison, as well as the numerous possibilities for economy, safety and convenience through the general use of electric lighting.

Over 12,000,000 copies of seventy popular, trade and technical magazines and newspapers are carrying Edison Day announcements to every nook and corner of the United States, reinforcing in a most effective manner local campaigns of the central stations and dealers.

Many local campaigns of lighting companies that have already been started will culminate on Edison Day. Some companies intend to show their appreciation of Edison's achievements by various novel features and by offering special inducements to non-users of electric service to begin its use at that time. Strong effort will be made to present the desirability of replacing inefficient carbon lamps with the modern efficient Edison Mazda lamps. The campaign will afford lighting companies the opportunity to combine all their separate campaigns.



Early Types of Edison Incandescent Electric Lamps.

AMERICAN ELECTROCHEMICAL SOCIETY.

Twenty-sixth General Meeting at Niagara Falls, October 1, 2 and 3.

The twenty-sixth general meeting of the American Electrochemical Society was held on October 1, 2 and 3 at Niagara Falls. Headquarters were at the Clifton Hotel on the Canadian side, at which sessions for the reading of papers were held on Thursday morning and Friday afternoon. The total registration at the meeting was about 230.

On Thursday afternoon an excursion was made to Niagara Glen, followed by a trip to the power house of the Ontario Power Company. In the evening a smoker was held at the Clifton Hotel, in charge of Section Q, which provided a very entertaining program in its characteristic style.

On Friday morning visits were made to the Acheson Graphite Company, the Niagara Alkali Company, the Hydraulic Power Company and the Spirella Corset Company. After the session in the afternoon, motion-picture films were exhibited at the Cataract Theater by the American Cyanamid Company, depicting the various operations in the manufacture of cyanamid. In the evening a banquet was held at the Clifton Hotel. This was followed by a lecture on "The Physical Nature of Color," by C. E. K. Mees.

Saturday was spent at the FitzGerald Laboratories, where a symposium on practical electrochemical applications was held and exhibits made of a number of furnaces and other apparatus. Between the sessions lunch was served at the substation of the Cliff Distributing Company, and an inspection was made of the factory of the Niagara Falls Linen Company.

Thursday Morning Session.

The first session of the meeting was held at the Clifton Hotel on Thursday and was called to order by President F. A. Lidbury at 10:10 a. m. Secretary J. W. Richards announced that the spring meeting of 1915 would be held at Atlantic City, N. J., and the fall meeting at San Francisco, Cal.

The first paper to be presented was by O. L. Kowalke, entitled "The Constancy of Base-Metal Thermocouples as Affected by Their Microstructure." In the absence of the author this was abstracted by G. A. Roush. The author had carried out experiments to determine the reason why certain thermocouples do not maintain constant calibration and made a number of microphotographs to show the structure of the metals after exposure for two hours to temperatures of 400, 600, 800 and 1,000 degrees centigrade, respectively. The couples investigated were made up of elements consisting of iron, alloys of nickel and chromium, nickel and copper, and others containing slight percentages of aluminum and silicon. The author concluded that silicon is not a desirable constituent in a nickel alloy; that segregation has an undesirable effect on constancy; and that the most satisfactory metals for the purpose are those which form solid solutions one with another and have high melting points. Wires containing but one metal showed a satisfactory structure.

Charles B. Thwing submitted written discussion which was read by Professor Roush. He had investigated the relation of thermoelectromotive force to the coefficient of expansion and had decided it to be due to the structure. An investigation similar to that of the author would be valuable in the case of platinum, which has sometimes failed in use through crystallization.

W. R. Mott called attention to the fact that the electromotive force in the case of deoxidized silicon differs by as much as 100 microvolts per degree from silicon containing oxygen.

Joseph W. Richards told of commercial thermocouples which in use showed variations in their indications of from 10 to 100 degrees centigrade from the certified values.

B. L. Glascock stated that in practice the calibration of couples given by the makers is usually assumed to be correct. However, one of these which had been tested was found to differ by 8 to 52 degrees from the indications of a platinum-iridium couple against which it was checked. In answer to a question by M. G. Lloyd, W. A. McKnight said that the composition of the couple referred to by Mr. Glascock was unknown, but it consisted of alloys said to be suitable for use up to 1,250 degrees.

A paper by Henry Ziegel on "Electrometric Titrations" was then presented by W. Lash Miller. This paper described a method for automatically regulating the stopcock of a burette when the end of a titration is reached. The method is based upon the change in potential in a solution at the end point when a bichromate solution is reduced by a solution of a ferrous salt. This potential change is about 0.2 volt.

G. A. Roush told of some similar work which had already been described in current literature, but without the action of the stopcock being made automatic.

W. F. Bleecker considered the labor in titrating negligible compared to the work of preparing the solutions and the slight saving in labor by having this automatic of little value. In the case of manganese, similar automatic control could be had by means of a beam of light passing through the solution and controlling an electric circuit which would shut off the burette.

F. A. Lidbury considered such applications of considerable importance, since hand titration is not always satisfactory and an electrometric indication may be more sensitive, as in the case of a silver electrode. Such titrations can probably be used in many cases which are not now foreseen.

W. R. Whitney told of a case where the resistance of an alkali solution changed abruptly when it became acid and in such cases resistance would be a good indicator rather than electromotive force.

J. W. Richards, W. Lash Miller, William Brady, G. K. Herzog, F. C. Frary and H. C. Chapin also joined in the discussion.

A paper by F. H. Getman entitled "The Reproducibility of the Copper Electrode" was then presented by W. R. Whitney. The author had carried out experiments on the variation in copper electrodes prepared in the same manner. The difference of potential between the metal and solutions of its salts sometimes differed by as much as 10 millivolts. Concentration cells were employed and the electromotive force measured with electrodes prepared in different ways. The variations found were greater than the experimental errors, but the value with spongy copper agreed with the value computed by the Nernst equation. This is the only form of copper with which constant and reproducible results can be obtained. To determine the cause of variations with other forms, measurements were made with a piece of copper wire polished with clean emery cloth; again after hammering and polishing; and again after heating to redness and quenching. The respective values were 0.4330, 0.4339 and 0.4268. The author concluded that surface strains are not the cause of the differences, which are rather to be attributed to different modifications of the metal and the fact that it is ordinarily in a metastable condition.

This paper was discussed by W. C. Moore, G. A. Roush, W. R. Mott, J. W. Richards, F. C. Frary, W. Lash Miller and H. C. Chapin. Several of the speakers disagreed with the conclusions of the author. Professor Roush pointed out that it is the surface condition of the metal which determines the voltage rather than internal strains, and that the surface condition had been produced by the polishing both before and after hammering, which would account for the slight difference in these two cases. Professor Richards pointed out that the direction of the slight changes found indicated

a higher electromotive force when the metal is strained. He pointed out the importance of this in connection with corrosion, which usually takes place in a metal which has been worked and is not evenly strained, thus giving rise to local currents. Professor Frary pointed out that spongy copper is usually contaminated with impurities and that slight changes in the solution are more important than slight changes in the electrode.

A paper by Lawrence Addicks entitled "The Sources of Impurities in Cathode Copper" was then presented by L. D. Vorce.

Impurities in refined copper may (*a*) cause a low electrical conductivity; (*b*) result in brittleness or weakness; or (*c*) be a source of loss of by-products of value. The first class is represented by phosphorus, aluminium, silicon, arsenic and antimony; the second by bismuth, lead, tellurium and selenium; and the last by silver, gold, platinum and palladium. It is further interesting to note, that class (*a*) forms with copper alloys of excellent mechanical properties, while class (*b*) is practically insoluble in copper, forming a brittle matrix around the copper grains in the cast bar. From the refining point of view impurities may be due to (*d*) electrolytic deposition; (*e*) inclusion of electrolyte in the crystalline structure of the cathode; (*f*) mechanical contamination from anode slimes suspended in the electrolyte and attaching themselves to the cathode; and (*g*) substances entering during melting from furnace, fuel and tools, and from other outside sources. Finished copper is guaranteed to run at least 99.88 per cent copper; commonly it does run 99.93 per cent in the melted bar and it is very unusual to find 0.01 per cent of any one impurity except oxygen, probably as cuprous oxide in solid solution, or possibly some other dissolved gas, such as argon or carbon monoxide. The copper content specification is intended to control this gas content, which is innocuous within these limits, while a conductivity guarantee imposes a very strict limit upon the impurities of class (*a*). Class (*b*) is ignored in specifications because these elements are but very rarely present in undesirable quantities and those who have studied the question longest do not feel confident to prescribe any definite limits, on account of the compensating action of different impurities upon one another. Class (*c*) does no harm in quantities a refiner can possibly afford to let go out, as but very small amounts of these elements need be present to pay for a re-refining.

The author then considered the possibilities of contamination by various elements through each of the four means, (*d*), (*e*), (*f*) and (*g*). Endeavors to correlate the impurities from each source have not been very satisfactory, since the amounts found are not proportional to those expected from analyses of slime, electrolyte, etc. Curves were given showing the relation between current density and gold and silver in cathodes, between arsenic present in electrolyte and conductivity of bars, between arsenic present in electrolyte and in bars, and between nickel present in electrolyte and in bars. The last two indicate proportionality.

W. D. Bancroft sent in written discussion which was read by Secretary Richards. He said that deposits of nickel in amounts which increased with the concentration was probably due to the formation of a compound of copper and nickel.

W. R. Whitney said that it would pay to refine copper to a state of greater purity for electrical purposes than is done at present.

N. Judson Marsh then presented a paper entitled "The Electrolytic Determination of Nickel." This referred principally to the use of a solution containing an excess of ammonium oxalate for the purpose, as generally recommended in textbooks. The author had not found this method accurate nor easy to carry out. His work showed it preferable to use a solution containing ammonium sulphate and ammonium hydroxide.

This paper was discussed by F. C. Frary and J. W. Richards.

A paper by Herman Schlundt entitled "Experiments on the Quantitative Determination of Radium" was then abstracted by W. F. Bleecker. The method employed for determinations of radium consists in separating the emanation and measuring with an electrometer the saturation current produced under definite conditions. The important point is to secure the complete separation of the emanation from the specimen and different methods of doing this were considered by the author. He concluded that fusion of the ore with mixed carbonates is superior to fusion with potassium acid sulphate. The solution method gave results 20 to 30 per cent too small. Fusion with borax also gave low results. A rough assay of carnotite may be made by merely heating the ore to bright redness.

G. A. Roush read discussion which had been submitted by S. C. Lind. Mr. Lind had found a variety of methods desirable for use with ores from different sources. He agreed with some of the conclusions of the author but disagreed with others, especially regarding the use of carbonates. Pitchblende and carnotite must be treated differently.

The paper was further discussed by W. F. Bleecker, W. R. Mott, J. W. Richards and W. Lash Miller. Mr. Bleecker emphasized the desirability of an accurate method that is easy of application, and exhibited a piece of uranium carbide prepared in the electric furnace which was pyrophoric. The discussion turned upon the question of whether uranium, vanadium and their compounds are poisonous, as has been claimed. Mr. Mott stated that it was very difficult to get solutions of such salts through the membranes of the body. Dr. Richards told of a case of poisoning from handling carnotite ores. Mr. Bleecker told of workmen who had handled this material for years and had breathed uranium fumes without poisoning. Since uranium salts are easily soluble he thought they ought to find access to the body and show results if they were really poisonous.

On motion of W. R. Whitney, a committee consisting of W. F. Bleecker, W. R. Mott and Albert R. Ledoux was appointed to investigate the question as to whether the substances were poisonous.

Friday Afternoon Session.

President Lidbury called the second session to order at 2:30 p. m. on Friday. The first paper presented was one by F. J. Tone entitled, "Silicidized Carbon—Silfrax."

When solid carbon is acted upon by vapors of silica or silicon there is formed a silicon-carbide product of the same shape as the original carbon but differing from carborundum in essential characteristics. To distinguish this form of silicidized carbon commercially, it has been given the name "silfrax." The properties and characteristics of the product vary with the temperature of formation. If the carbon article is heated in the amorphous zone of a carborundum furnace the temperature range of this zone being 1,550 to 1,820 degrees, the product is amorphous in appearance, showing no crystals except under high magnification. It has a yellow color and a lusterless fracture. If the carbon is heated in the crystalline zone of the furnace, the temperature of this zone ranging from 1,820 to 2,220 degrees, the material is of great density and plainly crystalline. Upon fracture it shows a steel black color and a metallic luster.

Chemical analysis of the two varieties made in the amorphous and crystalline zones show that both are silicon carbide and give no basis for regarding the products as new compounds of silicon and carbon. Microscopical examinations show in all cases the pres-

ence of the typical hexagonal crystals of silicon carbide.

The author then considered the reactions which go on in a carborundum furnace, and stated that the vapor tension of carbon could not be appreciable, since the graphite pseudomorphs produced retain the shapes of the carborundum crystals. Consequently the large crystal growths cannot be due to the union of vapors of carbon and silicon.

The commercial applications of silfrax are as refractory materials, electrical heating elements and chemical ware. It has all the chemical and heat-resisting properties of carborundum and in addition great density and toughness. Heretofore the articles produced have been of small size. Pyrometer tubes are now made 24 inches in length.

Other commercial applications will be given in a future paper.

This paper was discussed by C. B. Thwing, J. W. Richards, F. A. J. FitzGerald, W. R. Mott, W. C. Moore, A. T. Hinckley, A. H. Cowles, H. W. Gillett and F. A. Lidbury. The contention of the author that carbon vapor was not appreciable at the furnace temperature was combated. Mr. FitzGerald described a number of experiments performed under conditions similar to those described by Mr. Tone, but which were varied so as to give various resulting products, of which he showed samples. Mr. Mott on the other hand estimated the boiling point of silicon carbide as in the neighborhood of 2,200 degrees centigrade and the vapor pressure of carbon must be very low at this temperature or we could not have a carbon-filament incandescent lamp. Other experiments indicate, however, that though the pressure of carbon may be very small it might still take part in the reaction. Professor Richards showed how the vapor tension of carbon at comparatively low temperatures could be determined from its relation at high temperatures to the values for other substances, such as mercury, since absolute temperatures are proportional for different pressures. At the temperature of the carborundum furnace the vapor pressure of carbon would be as great as that of zinc at the temperature used in the sherardizing process. In answer to questions regarding the permeability of silfrax to gases, which is of importance in pyrometer work, Mr. Gillett said that this is the main difficulty at present. He has found the tubes satisfactory in other respects, as they can be plunged into molten brass without damage. It will be desirable, however, to give the tubes an impervious inner coating for use with thermocouples. Mr. Lidbury thought the conclusions of the author had been drawn from facts which would admit of several different interpretations.

In closing, Mr. Tone admitted that his theory could not be right if the vapor tension of carbon were sufficient to influence the reaction. He quoted Crookes as authority for the statement that the vapor tension was unappreciable at 2,700 degrees centigrade. Mr. FitzGerald's experiments, he said, were not so conducted as to exclude oxygen, silicon and other substances, which were enough to vary the reactions considered. If the carbon vapor were active it is strange that minute markings will persist on the faces of the crystals.

C. E. Skinner then presented a paper prepared by himself and L. W. Chubb on "The Electrolytic Insulation of Aluminum Wire." This described a process of coating aluminum wires with a film of non-conductor through immersion in an electrolytic bath, for which the best substance found was a solution of sodium silicate. The method of developing a commercial process was described. This resulted in passing the wire to be coated through five tanks, of which the first and last contained hot water for washing and the others electrolyte. Wire can be treated at a rate of 40 to 150 feet per minute with a consumption of energy from 0.15 to 0.80 watt-hours per square inch of surface. About 425 volts is used, which gives a film capable of resisting this same voltage. The thickness of the film varies from 0.0001 to 0.0004 inch. The film is quite flexible and does not open or weaken by sharp bends in the wire. Soft wire can be stretched 30 per cent of its length without apparent injury to the insulation. Two wires can be crossed and pressed together while maintaining the difference in potential of 250 volts. The coating appears to consist of alumina and has high dielectric strength and high specific capacitance. This wire is suitable for many classes of work where insulation requirements are not excessive but temperature requirements are severe, especially where weight is an object. With the small sizes of wire there is space economy over insulated copper wire and the heat dissipation is also better through the aluminum.

W. R. Mott told of early work along the same line for which he had filed a patent application, but had lost in the interference proceedings on account of not reducing to practice. He thought the film contained other salts beside oxide.

H. M. Hall told of coating square aluminum wire which is a more difficult problem on account of the corners, which must be blunt to get satisfactory results. He had found it satisfactory to coat the wire with alternating current and had used sodium silicate, which gave a coating consisting largely of the silicate.

A paper by C. E. Skinner and L. W. Chubb entitled "Electro-Percussive Welding" was then presented by Mr. Chubb. This paper described a method for joining aluminum wires or wires of aluminum and other substances by causing a condenser discharge to pass between the points of contact at the instant they are pressed together. One wire is mounted in a chuck in a stationary position and the other is driven against it by a moving weight, the weight and velocity being varied according to the size and material of the wire to be welded. An electrolytic condenser is used. The generation of heat is thus localized and is sudden and intense. The weld is complete in 0.0012 second and involves an energy of only 0.0000012 kilowatt-hour. Samples of welds between aluminum wires were shown; also between aluminum and copper, the joint remaining ductile enough to be rolled into thin foil. The method may also be applied to other metals and may be used for attaching contact points of platinum, tungsten, silver, etc. So far wires up to No. 13 have been welded. It is especially useful as an alternative to soldering small aluminum wires where the presence of oxide has always produced difficulties in securing a good and permanent joint.

The next paper was by W. Lash Miller and was entitled "On the Formation of a Badly Conducting Film on a Copper Anode in Copper Cyanide Solutions." This described some experiments showing that the use of too great current density causes the formation of a poorly conducting film and determining the limiting current density for avoiding such films.

F. C. Mathers then presented two papers. The first was entitled "Electrodeposition of Lead From Lead-Acetate Solutions." The second was entitled "Electrodeposition of Lead From Lead-Lactate and Lead-Formate Solutions," by F. C. Mathers and B. W. Cockrum. These papers extended the work of the authors in lead plating as reported at previous conventions. A large number of samples were shown, exhibiting the types of deposits secured under different conditions. The main question to be decided is the choice of a suitable organic addition agent to secure smooth deposits. Heretofore baths of lead fluosilicate and lead perchlorate are the only ones that have been used successfully in lead plating. They are objectionable only because they must be made by special apparatus and troublesome methods. Aloes was found to be the

best addition agent for baths of lead acetate and results were best in the presence of several per cent of ammonium perchlorate. Aloes is best used in the form of the insoluble residue remaining after extraction with water. Such residues are available in large amounts from the commercial production of aloin. Details are given for the proper manipulation of the bath according to which smooth crystaline deposits of lead may be obtained from acetate baths.

Smooth, thick, firm and crystaline deposits may be obtained in baths of lead lactate and lead formate. The best addition agent here also is Barbadoes aloes. The deposits are, however, rather brittle and the disadvantage of such baths is that a low current density must be used.

These papers were discussed by W. Lash Miller, S. S. Sadtler, F. C. Frary, J. W. Richards and G. A. Roush. Mr. Sadtler thought that the deposit of lead might be a secondary reaction, since it seems always necessary to add alkali metal ions. Professor Roush pointed out that the density of the lead seems always to be lower than the density of cast metal, which is the reverse from experience with copper. Professor Richards explained this as due to the fact that cast copper usually contains gases, which cause a low specific gravity; whereas cast lead does not.

In reply to a question, Professor Mathers stated that the chemical composition of aloes is unknown; that it cost about ten cents per pound; that about 2.8 pounds would be required per ton of lead. The negative radical appears to be more important in the bath than the alkali ion.

Professor Mathers then presented another paper entitled "Electrodeposition of Tin From Tin Salts of Mineral Acids," by himself and B. W. Cochrum. This paper described attempts to obtain smooth finely crystaline deposits of tin from tin salts of mineral acids, but no good deposits could be obtained. To do so it seems necessary to find some good addition agent. Good deposits may be obtained from salts of certain organic acids, such as the oxalate.

Answering a question of H. C. Chapin as to what temperature was used for the best deposits, Professor Mathers replied that room temperature was used, which was probably above 19.5 degrees, which is the transition temperature between the amorphous and crystalline varieties of tin. Peptone was the only addition agent yet found which was satisfactory.

On Saturday a session was held at the Fitzgerald Laboratories at which demonstrations of furnaces and other apparatus were made. These were preceded by a paper by Otto Mantius, entitled "The Evaporator and the Power Problem in Electrochemical Plants." The author presented some of the factors and conditions which should be considered when laying out an electrochemical plant where an evaporating system has to work in connection with generation of power by steam. It was calculated that the most economical equipment for a plant of medium capacity would use a double effect.

This paper was discussed by A. H. Hooker, L. D. Vorce and E. M. Sergeant, the discussion referring particularly to the reasons for the wearing of tubes.

The general symposium opened with a demonstration by F. A. FitzGerald of the furnace for experimenting with carbon rods which was referred to in his discussion at the Friday session.

L. E. Saunders then exhibited a graphite resistor which was made by sawing a flat block so that incisions are made alternately from either side parallel to the ends, so as to give the current a devious path of limited cross-sections. This block forms the furnace resistor, being placed over the substance to be heated. It is used on a 110-volt circuit and can be used seven or eight times before being scrapped. Mr. Saunders also exhibited the direct heating of a carbon tube on a 50-volt circuit. As the tube became heated the current increased up to a value of about 1,500 amperes.

Mr. FitzGerald also exhibited an arc furnace of the Stassano type which was cheaply constructed of brick and pipe fittings; 12-inch graphite electrodes were used and the furnace top consisted of a vitrocarbon brick. Lime placed in a magnesite crucible was melted in about 10 minutes with a current of 1,200 amperes at 50 volts.

A. T. Hinckley demonstrated the measurement of the resistance of electrode joints made with packing material by using the drop-of-potential method and measuring the voltage over the joint and over an equal length of continuous rod. The joint used was one made with threaded electrodes. By using a special paste prepared by the National Carbon Company this joint can be made of such low resistance that it consumes only about one-half per cent of the total power. Mr. Hinckley also gave some data regarding the vitrocarbon brick which is manufactured by the same company. This brick is cheaper than some other refractories and will stand a high temperature better than silica and fire brick. There is no shrinkage. Its heat conductivity is between that of alundum and that of silicon carbide. The resistance of an inch cube is about one ohm and decreases with increasing temperature. It is an acid refractory. It eventually fails by becoming graphitized.

John B. Glaze demonstrated the winding of coils for furnace work, at small expense, using alundum as a refractory. Such furnaces are wound with nichrome wire for temperatures up to 1,000 degrees centigrade and are suitable for crucible work.

E. R. Cole, of the International Acheson Graphite Company, exhibited some peculiar shapes of graphite. One of these was a resistor unit made by cutting a tube in such a manner as to make a spiral conductor with the shape of a spiral spring. This is used in the Arsem furnace.

C. Dantsizen exhibited a furnace made up of units consisting of about 10 feet of molybdenum wire wound upon an alundum tube. The temperature attainable is limited by the melting point of alundum, which is about 1,900 degrees. The alundum tube is threaded and the wire wound in the thread. These tubes are set upon an alundum ring forming the bottom of the furnace. An atmosphere of hydrogen is maintained in the furnace to avoid oxidation of the wire.

Carl Hering exhibited a demonstration furnace for melting lead based upon the principle which is being applied in commercial furnaces and which was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN April 22, 1911. This furnace is intended for continuous operation. The pinch effect in the tubes constituting the resistor of the furnace causes a rapid circulation which keeps the entire bath of metal heated. In this furnace the electrodes are of the same material as the bath, but of larger cross-section. The furnace is not suitable for some substances, such as certain fused electrolytes, but in some cases the substance could be heated by a bath of molten metal underneath. The wear of the tube lining, which consists of magnesite, is very small. A brass furnace based upon this principle is working satisfactorily in Philadelphia, and it has also been applied to steel and other metals.

L. W. Chubb demonstrated an apparatus for electropercussive welding, as described in his paper at the Friday session. An electrolytic condenser consisting of 35 aluminum trays was charged at 500 volts and the discharge use to weld aluminum wires.

R. S. Wile exhibited a furnace for smelting tin dross. In this furnace molten glass forms a slag for the absorption of iron and other impurities and the slag level is kept constant by means of a drip hole. The furnace is continuous in its operation. Carbon is fed in at the top with the raw material.

By running at a temperature above 1,650 degrees centigrade, not more than one-half per cent of the tin is lost in the slag and an equal amount otherwise. Any vapors rise through the raw material and are condensed there. The furnace exhibited was a three-phase resistance furnace, but single-phase current is used in commercial application; 600 to 900 kilowatt-hours are required per ton of dross treated. Tin ores of all kinds have been worked in this furnace and a similar one has been built for making glass which operates satisfactorially. From 50 to 220 volts is utilized in different furnaces.

At the afternoon session P. E. Landolt, of the Research Corporation, demonstrated the Cottrell method of dust precipitation, which has been applied to fumes of various kinds. Alternating current of either 25 or 60 cycles is transformed to 40,000 volts and then rectified by means of a synchronous rotating switch. A direct-current discharge is thus produced between a central wire and a pipe which forms the stack. Fumes were produced by heating zinc dross and by burning phosphorus, and the particles were precipitated in the apparatus.

The voltage utilized may be from 15,000 to 100,000 volts, depending upon the diameter of the pipe carrying the fumes. Differences in the action depend upon the temperature, conductivity, dust contained and moisture of the substance acted upon. The central wire may be either the positive or negative terminal, but is usually negative, as the precipitation is better thus. This method has been applied to cement dust, smelters of various kinds, flour dust, borax, sulphuric acid and fumes of various kinds. The amount of discharge required has not been found proportioned to the amount of dust to be precipitated and does not seem to depend upon the speed of the gas. The deposit is usually flocculent in character. Alternating current will cause the deposit in a stationary gas or fog, but has not been found satisfactory where the gas is in motion, as the particles are only agglomerated and not deposited.

A. T. Hinckley, then demonstrated a method of measuring the rate of oxidation of carbon electrodes and gave results for different kinds of graphite.

F. A. J. FitzGerald then exhibited a tube furnace consisting of a carbon tube imbedded in granular coke and resting on a bed of cilicon carbide. The tube is placed with its axis at right angles to the flow of current and the projecting ends enable the contents of the tube to be seen and objects introduced.

A vote of thanks to the various persons and corporations extending courtesies to the members was then passed and the convention adjourned.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

Annual Convention at Spokane, Wash.

The seventh annual convention of the Northwest Electric Light and Power Association was held at the new Davenport Hotel, Spokane, Wash., on September 9 to 11. Most of the first day's proceedings were in joint session with the Pacific Coast convention of the American Institute of Electrical Engineers that have already been reported in our issue of September 19, pages 584 to 587.

Directly after the opening joint session on Wednesday morning, at which Mayor Hindley of Spokane delivered an eloquent address of welcome, the Northwest Association assembled by itself to listen to the annual presidential address delivered by President H. L. Bleecker. The report of Secretary N. W. Brockett was presented. The joint session in the afternoon has already been reported.

Branch Offices.

On Thursday morning the session opened with the presentation of a paper on "Organization and Operation of Branch Offices," by Lewis A. McArthur, assistant general manager of the Pacific Power & Light Company. This paper recorded the experience of that company in handling its many and widely scattered branch offices. Several methods were tried and discarded. The best results were obtained by selecting good, strong local managers and giving them considerable authority. This was found very much better than the endless reference of all trivial questions to the home office at Portland, Ore. The policy of the company is to carry on as much of its routine as possible at the branch offices. Mr. McArthur described in detail the organization and conduct of the branches, touching particularly on the ordering of supplies, the handling of customers' ledgers, etc.

The paper was discussed by Messrs. Steele, West, Osborn, Gates, Foster, Gunn, Nixon, Bertrand, Davidson and McArthur. Further details of the system employed by the Pacific company were explained. Simplicity was urged as the proper keynote of such an organization.

Extensions into Rural Districts.

M. C. Osborn, commercial agent of the Washington Water Power Company, presented a paper entitled "Extension of Electric Service into Small Communities and Rural Districts." A supplement to this paper was also presented by James E. Davidson, vice-president and general manager of the Pacific Power & Light Company.

Mr. Osborn's paper discussed the reasons for developing this class of business and the methods of obtaining it in new and small suburban towns. He showed in considerable detail estimates of revenue and construction costs and also the actual results obtained after one year of service. He also gave a general outline of the company management in the suburban towns.

Mr. Davidson's paper was devoted chiefly to electric irrigation pumping in rural districts. The construction and operating costs of such plants were discussed, as well as the earnings during the year 1913, based on the actual experience of the Pacific Power & Light Company in serving this class of customers. There were also given schedules of rates, contract requirements, and other data bearing on this service. Typical plants were described.

These papers were discussed jointly by Messrs. Kincaid, Gunn, Longure, Hall, Wells, Brockett, Baum, Osborn, McArthur and Davidson. Further details of the practices of the two companies described in the papers were brought out, also the policies of other companies. Interesting experiences were narrated, particularly in developing irrigation pumping. It was pointed out that the company representatives sent out to the farmers must be able to talk to them intelligently on farm problems, how conditions will be improved by electric service, the cost of the same, etc.

Electrical Appliances.

H. B. Pierce, assistant commercial agent, Washington Water Power Company, then read a paper on "Electrical Appliances." In this it was pointed out how a valuable load can be developed through the energetic pushing of the use of electrical appliances, particularly heating and cooking devices. The paper discussed the appliances which have been found of proven value in building up central-station load; special mention was also made of the possibilities of the electric range and electric hot-water heater. Methods for developing the use of appliances were pointed out.

This paper was discussed by Messrs. Bertrand, Henkle, Robinson and Pierce. It was pointed out that appliances should be more reasonable in first cost, and that they should be standardized. Electric fans have been rented for $5 a season, this applying to possible purchase. Electrically heated blankets, when well designed to remove all possibility of danger, furnish an excellent all-night load.

Rates.

Stacy Hamilton, rate expert, Portland Railway, Light & Power Company, read a paper entitled "Rates—A Résumé and Comparison of Rate Theories." The paper discussed the subject in a general way, taking up the various systems of determining rates and the advantages and disadvantages of each. First there are taken up the cost-of-service and value-of-service theories and their relative equities. The nine more or less common rate systems or forms of rates are then dis-

cussed in detail. The decisions of various courts and commissions on these systems are cited. The form of rate to be adopted depends frequently on local conditions and the previous rate system employed and to which the public has become accustomed.

The paper was discussed by Messrs. Osborn, McArthur and Burroughs. The latter, who is chief engineer of the Washington Public Service Commission, called attention to the fact that the electric companies in the Northwest, having mostly water-power plants, are confronted with a peculiar problem in that their fixed charges are high and output expenses relatively low. What is needed is to increase the load-factor and diversify the service.

Public Policy.

At the opening of the session on Friday morning, the paper on "Public Policy," by F. T. Post, general counsel of the Washington Water Power Company, was read by Secretary Brockett, owing to the absence of the author. This paper gave a review of the subject, chiefly from the legal standpoint. Several hundred years ago it was customary to regulate closely all details of utility as well as general business. At the beginning of the last century regulation had practically ceased. Subsequently regulation of utilities was revived and now is spreading throughout the country. However, the statutory law in many parts of the country is in such chaotic state that it is doubtful whether any settled public policy can be said to exist. However, among the policies that are becoming more general are the forbidding of ruinous competition and the sale of commodities at or below cost, the requirement that utility service shall be the best possible and the rates fair and reasonable, needless duplication of utility plants must be eliminated, etc. The latter tendency is counteracted by many statutory requirements that competition be unrestricted. The paper pointed out many inconsistencies in public policy of different states, due particularly to the exceptional privileges granted to municipal plants.

In opening the discussion, N. W. Brockett called attention to the open and above-board legislative work done by the Association in combating harassing legislation. On account of a renewed attempt of Washington municipalities to get what they call "Home Rule," further effort will be needed to present the utility side of the question fairly. Two amendments are needed to the public service commission laws of Washington and Oregon; these should provide for the indeterminate permit and the requirement of certificates of necessity and convenience before competing plants are allowed to operate.

George A. Lee, former chairman of the Washington Public Service Commission, spoke of the economic absurdity of duplicating public utilities, which is an absolute waste of capital. He cited several utilities that had to compete with subsequently established municipal plants. A small community cannot support duplicate utility plants; there will ensue either a rate war in which both plants will be destroyed, or one must absorb the other, then boost its rates to make up for losses incurred. The best commissions and courts are now agreed on this point and the Washington Commission can well suggest to the Legislature the enactment of the protective legislation suggested by Secretary Brockett. Mr. Lee dwelt on the uncertainties of the utility business and the need for insuring an adequate return on the investment.

C. M. Fassett, commissioner of public utilities of Spokane, Wash., said that it seemed impossible to adjust the rates of any public utility with absolute justice to all. A compromise must usually be made and the large customer obliged to pay a part of what is rendered to the small customer. H. L. Gray, formerly chief engineer of the Washington Public Service Commission, discussed at length the reasons why the rate per kilowatt-hour is higher in some small towns than in a large city. O. B. Coldwell, Portland Railway, Light & Power Company, called attention to the need for an accounting system which, while simple, will carefully apportion the cost of different classes of service. In these days when commissions are trying to establish rates for different branches of service based on cost, an exact knowledge of this cost is imperative. The general subject was discussed further by Messrs. Robinson, Gunn and Hamilton.

E. A. West, efficiency engineer of the Portland Railway, Light & Power Company then presented a paper entitled "Balances of Stores System for Light and Power Utilities." This paper described a system which, while now common in the industrial world, is relatively new to light and power plants. The first studies along this line were made by Fred W. Taylor and many large industrial concerns throughout the country have adopted the system. The paper shows in a logical way the proper handling of the stores problem from the time that the materials are requisitioned through the securing of the authority for purchase, the different steps involved in the receipt of the goods, verification of invoices, proper storage, delivery to the work, return of excess, and the manner of tying in the storeroom records with the records of general supplies in the auditor's office.

This paper was discussed by Messrs. Shinkle, Strange, Gunn and West.

Election of Officers.

At the election of officers of the Northwest Electric Light and Power Association the following named were chosen:

President: O. B. Coldwell, general superintendent, Portland Railway, Light & Power Company, Portland, Ore.

Vice-president for Washington: E. G. Robinson, Arlington, Wash.

Vice-president for Oregon: Attilla Norman, Eugene, Ore.

Vice-president for Idaho: Robert A. Foster, Lewiston, Idaho.

Secretary: E. A. West, efficiency engineer, Portland Railway, Light & Power Company, Portland, Ore.

Executive Committee: N. W. Brockett, Seattle, Wash.; W. J. Grambs, Seattle; Arthur Gunn, Wenatchee, Wash.; P. A. Bertrand, Aberdeen, Wash.; L. B. Faulkner, Olympia, Wash.; H. L. Bleecker, Spokane, Wash.

Entertainment.

Throughout the convention of the Northwest Electric Light and Power Association, and the Pacific Coast convention of the American Institute, a large number of entertainment features were provided. On each of the afternoons automobile trips dere provided for visiting ladies. On Wednesday evening a Dutch lunch was given at the Davenport Hotel and a theater party for ladies. On Thursday evening an illustrated lecture was given by A. H. Halloran, San Francisco, Cal., on "The Electrical Features of the Panama-Pacific International Exposition." This was followed by a musical and a buffet supper. On Friday evening a joint banquet was given at which President-elect O. B. Coldwell presided. Saturday was devoted to an automobile inspection trip to the Little Falls and Long Lake power plants of the Washington Water Power Company, and the Nine-Mile power plant of the Spokane & Inland Empire Railway Company. About 125 members, including a few ladies, took in this trip. On Saturday evening a rejuvenation of the Jovians in attendance at the conventions was held at Pythian Hall. On Sunday those remaining took a trip over the Inland Empire single-phase railway system to Hayden Lake; the Post Falls plant of the Washington Water Power Company was also visited.

Virginia Only Producer of Rutile.

Virginia produced all the American output of rutile in 1913, according to the United States Geological Survey, the deposits being located at Roseland, Nelson County. During the year 305 tons of rutile, valued at about $49,000, were produced.

A large part of the rutile produced in 1913 was used in the manufacture of titanium-carbide electrodes for arc lamps. A part of the ilmenite found in the deposits and separated by means of a magnetic separator has been sold for use in making electrodes for arc lamps, and the experiments with the electric furnace point to the possible use of ilmenite in the direct production of tool steel.

New Electrical and Mechanical Appliances

Miniature Transformer for All-Night Lamps.

Inability to turn down the ordinary electric lamp has been a great inconvenience to those who desire a low-burning lamp for all-night service. The demand for an electric light which could be burned all night without too much light and too great a cost for current has created several types of all-night electric lamps of which the so-called "Nite Lite" transformer lamp, produced by the General Electric Company, is the latest.

The device consists of a miniature transformer contained in a polished brass shell, and a miniature Mazda lamp. It operates on an alternating-current supply circuit ranging in potential from 100 to 125 volts, and in frequency from 50 to 140 cycles. It is installed by simply screwing it into the standard lamp socket in place of the usual incandescent lamp.

This transformer, although miniature in design, is constructed with liberally insulated primary and secondary coils, and with a core built of the highest grade of transformer steel punchings.

"Nite Lite" Transformer Lamp.

Its function is to transform the normal supply voltage to about six or seven volts before it is supplied to the lamp. The receptacle for the lamp is designed to fit a rear and speedometer Mazda automobile lamp of two candlepower with bayonet base, operating at an efficiency of 1.25 watts per candlepower.

The cost of operating this device continually is very low. At the average cost of electricity, a "Nite Lite" transformer lamp will burn for ten hours at a total cost of less than four-tenths of a cent. The device is especially adapted to the illumination of door numbers, sick rooms, nurseries, bath rooms, closets, etc.

New Steel-Frame Direct-Current Motors.

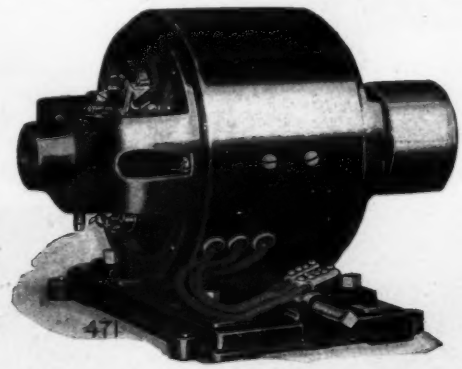
The illustrations herewith show a new line of direct-current motors recently placed on the market by the Robbins & Myers Company, Springfield, O. These motors have cast-steel frames and are especially adapted for any service where the space for installing the motors is restricted, or where light and compact construction is desirable for any reason.

Disassembled Parts of "Nite Lite" Outfit.

These motors are of the bipolar type and are made in four frame sizes with eight different outputs ranging from one-eighth to two horsepower. They are supplied for operation on all standard voltages.

The line includes open, fully inclosed, semi-inclosed and grid-type frames. The motors can also be supplied equipped with idler-pulley attachments or back gears where this construction is desired. All standard outfits are equipped with sliding bases, pulleys, and no-voltage release starters.

Bearings are of phosphor bronze and are lubricated by oil rings. The pole pieces and armature core are built up of steel laminations. The armature coils are wound directly into the slots. The brush-holders are mounted on an adjustable rocker and are of the sliding-box type.



One-Horsepower Open-Type Motor.

One-Half-Horsepower Fully Inclosed Motor with Idler Pulley.

Storage-Battery Cars.

Two storage-battery cars of the Edison-Beach type are being operated on the Central Vermont Railroad in Southern Vermont. Each car makes two runs, of 42 and 44 miles a day and is equipped to carry 60 passengers. The runs are between Brattleboro and West Townshend and Brattleboro and Miller's Falls, Mass.

The battery equipment of each car is a 230-cell Edison accumulator with a capacity of 450 ampere-hours. Four Diehl 20-horsepower motors provide the motive power, and the cars are operated from either end by Cutler-Hammer controllers.

Charging facilities are provided by the Twin State Gas & Electric Company at Brattleboro, though a rotary converter at about 600 volts. The main charge is given in the evening and a boosting charge of a half-hour is given between runs. It is stated the cars consume less than an average of 4.5 kilowatt-hours per mile.

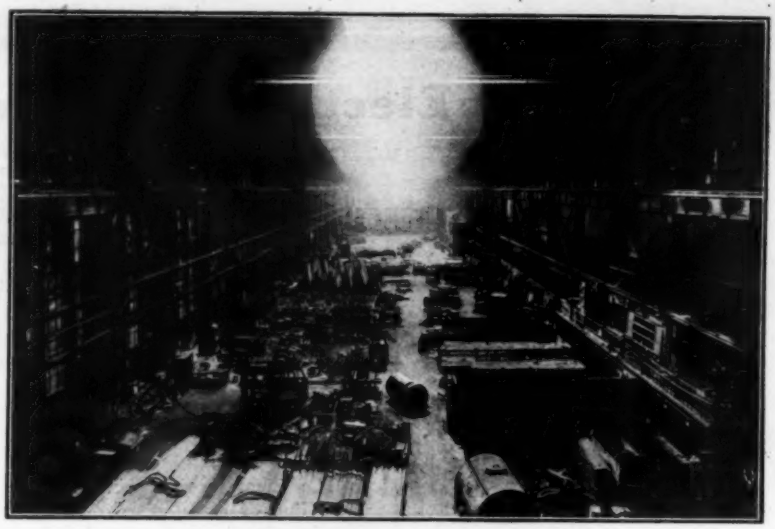
Citizens of Brattleboro financed the undertaking, subscribing $40,000 for the purchase of two cars and a trailer, the amount to be repaid by the company.

An Exceptionally Well Lighted Railroad Shop.

The manifold advantages of having adequate illumination in an industrial plant are being realized by no class of operators more readily than the far-seeing railroad men. Not only does the proper illumination of a shop mean a better and more efficient class of work turned out, but exhaustive tests recently made in a large industrial plant proved conclusively that a workman actually made a gain of several minutes per day in the production of a given piece of work, owing entirely to the better illumination with which he was supplied. These few minutes when multiplied by a large number of workmen amount to a considerable daily item for the entire shop.

There are shown herewith some views of an excellently lighted boiler shop and erection shop of a prominent eastern railroad. As will be noted from a glance at the photographs reproduced herewith, which were taken at night, the illmination is abundant but without glare or dark shadows and reaches every part of the shops very uniformiy. The buildings are 528 feet long and 58 feet wide, giving an area of 30,624 feet in each building.

The illumination for these buildings is furnished by type Z Cooper Hewitt quartz lamps operating on a 220-volt direct-current circuit. The details of construction of this lamp have been described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 23, 1912, and February 8, 1913. The lamp uses mercury vapor, and a short tube of pure fused quartz, instead of the long tube of lead glass in the older Cooper Hewitt mercury-vapor lamps.



View in Boiler Shop Illuminated by Quartz Lamps.

View in Erecting Shop.

Ten lamps are installed in the boiler shop, placed at regular intervals of 52 feet down the middle of the building, each lamp lighting an average of 3,062 square feet. In the erecting shop are twelve lamps regularly spaced down the middle of the building at intervals of 44 feet, giving an average space lighted by each lamp of 2,552 feet. All the lamps are hung at a height of 50 feet above the floor.

The lamps are rated at 2,400 candlepower with an energy consumption of 725 watts each, or a total for the installation of approximately 16 kilowatts.

It has been found that the light afforded by these lamps is entirely sufficient for all purposes, even the locomotive pit being well illuminated. The only other form of artificial light required is a portable hand lamp needed

Another View in Boiler Shop.

by the workman when he goes inside the boiler.

The total lumens per lamp from these units is 14,603, with a total available in a zone of 0 to 60 degrees of 10,800 lumens per lamp which, with a wattage of 725, gives a value of 20.2 total lumens per watt, and 14.9 available lumens per watt.

The efficiency of the system as installed is made evident from the low wattage consumptions obtained per square foot, these values being 0.28 for the erecting shop and 0.24 for the boiler shop, the former being said to be the best lighted erecting shop in the country. The average illumination values obtained in candle-feet are 4.24 for the erecting shop and 3.53 for the boiler shop.

No better evidence of the success of the installation from a practical viewpoint can be secured than the universal commendation of the employees who are working under the light. They are universally pleased with it and the results they are able to obtain.

It is interesting to note, however, that when a trial installation of four lamps was first made, there was a certain antipathy to the light on the part of the men employed, because of the difference in color value, but this speedily disappeared after they gave it a thorough trial. This trial resulted in the adoption of the complete installation of these units.

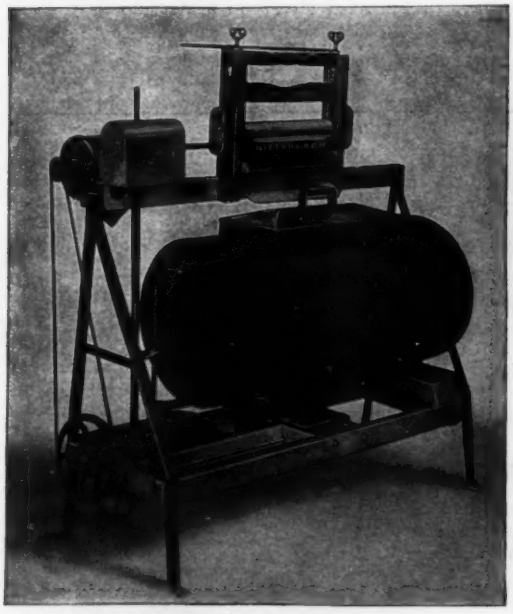
The lamps have been installed at various times, but the entire installation averages practically 16 months. The maintenance charge for the period totals $134.54 or $4.58 per lamp per year.

A New Electric Washing Machine.

The Invincible Manufacturing Company, of Pittsburgh, Pa., has recently put on the market a washing machine of an entirely new type. The clothes are placed in a cylinder, but instead of revolving in the usual manner the cylinder of the Invincible washer oscillates on its vertical axis. This motion drives the suds backward and forward and subjects the clothes to a very vigorous cleaning action. Furthermore, there is no tendency for the clothes to form into a ball; in fact clothes tightly matted together can be put into the machine and be untangled by it.

A special feature is a perforated box which runs along the bottom of the cylinder. At this point the suds are practically quiet so that all sand, grit and foreign matter collects here, without being constantly distributed through the clothes, and can be run off through the drain cock.

The wringer is reversible and has a quick release by means of which the pressure on the rollers can be instantly released should the clothes tangle or the fingers be caught. The cylinder is of copper, heavily tinned inside. The drive is very simple and offers no danger to the most careless operator. Power is applied by a one-eighth horsepower Westinghouse electric motor, which can operate both wringer and washer at the same time.



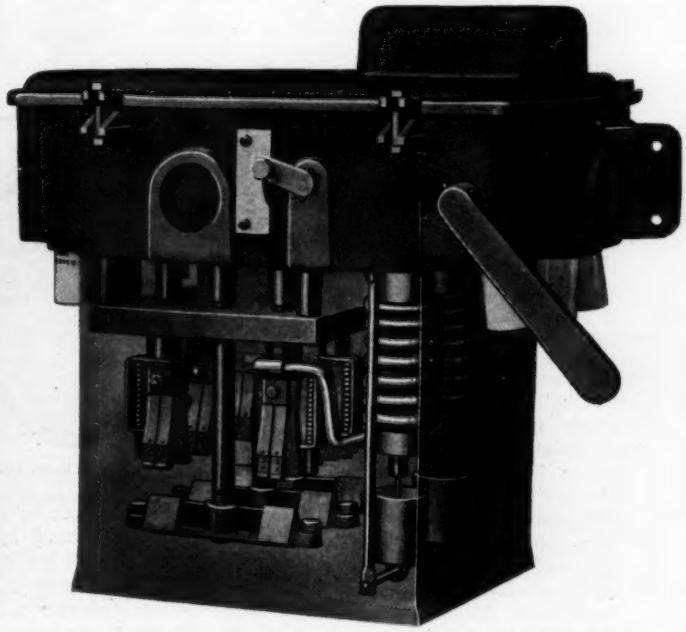
"Invincible" Electric Oscillating Washer.

Automatic Oil Circuit-Breaker.

A weatherproof automatic oil circuit-breaker, especially adapted for outdoor service for all voltages up to 2,500 volts, has recently been placed on the market.

All live parts of the breaker are submerged in oil. Auxiliary contacts protect the main contacts from all burning when opened under load. The cut herewith clearly shows the construction of the circuit-breaker but does not picture the barriers which separate the three poles of the breaker. The handle is independent of the tripping mechanism so that it is impossible to hold the breaker in a closed position when an excessive load exists on the lines. The open position of the breaker is maintained by gravity and the handle indicates the position of the contacts.

These outdoor breakers are made in 50, 75, 100 and 300-ampere capacities. The overload tripping mechanism is of the inverse-time-limit type and is adjustable from outside of the case between 80 and 160 per cent of its rated capacity. The welded sheet-iron tanks are lined with insulating material and can be readily removed for inspection of contacts, etc.



Combined Outer and Inner View of Outdoor Oil Circuit-Breaker.

This apparatus is being sold by the Transmission Engineering Company, Greensburg, Pa.

Tungsten Supply.

The tungsten resources of the United States are probably considerably larger than have been generally realized. Many new deposits have been discovered in various parts of the western states, according to the United States Geological Survey, and, should prices advance, it is probable that the output could soon be increased much above the record year of 1910, when 1,821 tons were marketed.

New Ornate and Efficient Fixtures for Church Lighting.

In the construction of the average church, cathedral or Sunday-school room, the subject of artificial lighting is rarely given the careful consideration to which it is entitled, although it is true that many such buildings are beautifully illuminated.

New Semi-Indirect Church Lighting Fixture.

Two points are vital if perfect illumination is to be secured: There must be sufficient light to permit reading with ease in every part of the room; and the fixtures should be so constructed and placed that neither the preacher (or speaker), the members of the choir, nor the people occupying the auditorium shall have their eyes affected by glare.

Many jokes have been written of people falling asleep in church. Much of this apparent sleepiness is caused by the glare of the lights, forcing the occasional closing of the eyes for rest, which easily progresses to "napping." Nor is it improbable that the sermon is at times not as stirring as it might be, because of this same glare in the eyes of the speaker.

Formerly, only direct lighting was used. There was a bright illumination, but it was concentrated; there was no diffusion—no relief for the eyes. Then indirect lighting was evolved. This did away with the glare, as the lamp itself was not visible. But the efficiency of the illumination was reduced.

A striking advance has recently been made in this direction in a new fixture so constructed that it not only gathers and utilizes all the rays from the lamp, giving a clear and relatively shadowless and glareless light, but it accomplished this with fewer light units, of less total wattage, and a resultant reduction in current consumption.

As an example may be cited St. Alphonsus Church, in St. Louis, Mo.

Combined Direct and Semi-Indirect Fixture.

Here, ordinary direct lighting of 70,000 wattage was displaced by these new fixtures which took but 4,500 watts, a saving of 65,500 watts and a gain of much better illumination.

Owing to the construction of the fixture, and the relative positions of lamp, bowl and reflector, the fixture actually controls the light rays—a portion of which are softly diffused through the bowl, while the balance are thrown up to the flat reflecting plane, and in turn reflected outward and downward. Photometric tests, made by the Electrical Testing Laboratories, New York City, for the New York Edison Company, show this illumination to be more efficient than direct lighting and 50 per cent more efficient than indirect lighting, yet with all the visual comfort and diffusive benefits of the latter. The tests were made with a clear 250-watt tungsten lamp. Incidentally, because of the excellent character of lamp ventilation provided, high-efficiency gas-filled tungsten lamps also give superior results in this fixture.

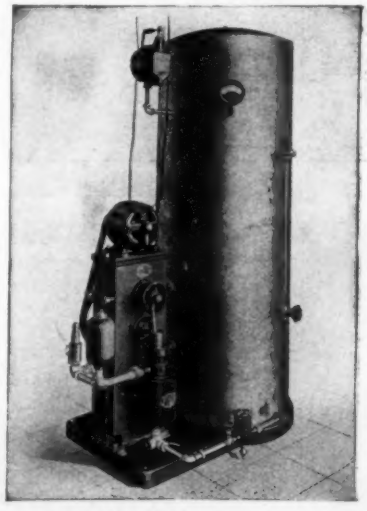
Semi-Indirect Bracket Fixture.

Many designs of these fixtures have been prepared to be especially suitable for church lighting. Those illustrating this article indicate the beauty of design and harmony with church architecture and furnishings. These fixtures have been designed and manufactured by the Luminous Unit Company, St. Louis, Mo., which has made an extended study of ecclesiastical lighting.

A New Electric House Pump.

A somewhat novel type of electric pump for residence use has been designed by the Ft. Wayne Engineering & Manufacturing Company, Ft. Wayne, Ind. As shown in the illustration, the pump, pressure tank and all accessories are mounted on a bedplate forming a self-contained unit.

The pump is driven by a small Westinghouse electric motor, which is mounted above the floor, so as to be removed from dirt and water, and is belted to a countershaft geared to the pump. The gears are inclosed within the cast-iron stand on which the pump and motor are mounted.



Paul Electric House Pump.

Included with the outfit are an automatic priming device, which insures a supply of compressed air inside the tank, and an automatic pressure controller.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTO-STARTERS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Starting compensators, 5 to 200 horsepower, for voltages 110, 220, 440 and 550.

Bulletin No. 9620, self-starter solenoid-operated switches, with time element, overload relays and air-cooled compensators. In the off position the compensator and motor windings are disconnected from the line.

This manufacturer also furnishes auto-starters for circuits of voltages higher than 600 volts. These will be generally acceptable for use when installed in accordance with the requirements of inspection departments having jurisdiction.

Approved September 1, 1914.

CABINETS.—Batavia Switchboard Company, Batavia, N. Y.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories, Incorporated, to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, Incorporated, have labels attached.

Approved September 10, 1914.

CABINETS.—Eldridge Switch & Meter Box Company, 204 Bissell Block, Pittsburgh, Pa.

Sealable service and meter cabinet.

A special sheet-metal cabinet for inclosing and sealing service switch, fuses and meter. A switch-operating handle projects through the cover of the cabinet.

Approved August 14, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

"Union" outlet bushings and couplings made of coppered steel in the form of a clamp for armored cable and flexible conduit. For use with five-eighth-inch knockouts or furnished with adapting washers for use with seven-eighth-inch knockouts.

Approved August 26, 1914.

FLEXIBLE CORD.—Charles H. McEvoy, Lowell, Mass.

Marking: One blue thread cabled with copper strands.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Approved August 31, 1914.

FLEXIBLE-TUBING FASTENERS.—New Process Specialty Company, 709 M. & M. Bank Building, Milwaukee, Wis.

Flexible-tubing clamps. Pressed metal clamps for supporting tubing and holding same at outlets.

"Universal" bushings; catalog No. 4, for use with switch and outlet boxes.

Approved August 14, 1914.

GROUND CLAMPS—Warder, Clark & Chaplin Electric Company, Incorporated, 406 East Main Street, Rochester, N. Y.

"W. C. & C." ground clamp.

A single-piece clamp of copper, provided with suitably spaced holes and with bolt, nut and washer for clamping to rigid conduit. Adjustable for use with conduit up to 1.25 inches in size. One end of clamp is channeled to form the equivalent of a lug for soldering to the ground wire. The bolt, nut and washer are protected against corrosion.

Approved August 26, 1914.

HANGERBOARDS, Lamp and Fixture.—George Cutter Company, South Bend, Ind.

A two-part interlocking hanger which provides a support for a fixture or lamp cluster and makes possible the raising or lowering of such fixture or cluster without the use of slack loops in the supply wires.

For use only on low, constant-potential circuits.

Approved August 14, 1914.

HEATERS, Electric. — Berkeley Electric Cooker Company, 228 Monadnock Building, San Francisco, Cal.

"AV-R" automatic steam oven, 550 watts, 110 volts.

This device is similar to a fireless cooker, but has a heating element and thermostat for heat regulation located in the bottom of an inner compartment, the device being formed of two sheet metal jackets filled with cork and mineral wool.

Approved August 14, 1914.

PICTURE MACHINES AND APPLIANCES.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

Control panel for use with direct-current, or alternating-current to direct-current compensares, consisting of a field rheostat mounted in a sheet-metal inclosure with the handle projecting through a slot in the front, on which are mounted an ammeter and voltmeter. Designed to be mounted on the walls of approved picture-machine booths.

Approved August 24, 1914.

RECEPTACLES, For Attachment Plugs.—Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

"H. & H." flush receptacle and plug, 10 amperes, 250 volts, catalog No. 2934.

Approved August 24, 1914.

RECEPTACLES, Standard.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Keyless, 660 watts, 250 volts, catalog Nos. 470-77 inclusive, 571, 573, 575, 577.

Approved August 12, 1914.

ROSETTES, Inclosed Fuse.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Ceiling pull-switch rosettes, catalog Nos. 5992 and 5993.

With "Economy Extender" catalog Nos. 6003 and 6004.

Approved August 26, 1914.

ROSETTES, Fuseless.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C. E. M. Co." three amperes, 250 volts.

Cleat, catalog No. 2752.

Concealed, catalog No. 2753.

Molding, catalog No. 2754.

Approved August 28, 1914.

SOCKETS, Standard.—Wirt Company, Armat and Lena Streets, Germantown, Philadelphia, Pa.

Turn Down "Dim-a-lite," 16 candlepower, 125 volts, extension socket, having Edison screw-shell plug and lamp regulating resistance, controlled by a pull cord.

Turn shade socket "Dim-a-lite," 40 watts, 110 volts, controlled by turning shade holder.

Approved August 27, 1914.

SOCKETS, Standard.—Monarch Electric Company, Waterman and St. Lawrence Streets, St. Lambert, Quebec, Canada.

"Monarch" brass-shell sockets.

Pull, 250 watts, 250 volts.

Approved August 26, 1914.

SWITCHES, Combination Cutout.—Metropolitan Engineering Company, 1238-1252 Atlantic Avenue, Brooklyn, N. Y.

"M. E. Co." combination repulsion fuse cutout and meter-testing block, 250 volts, 0-30 amperes, catalog No. 139, consisting of a three-pole cutout base with meter-testing clips and repulsion-type fuses, mounted in a cabinet with an external handle whereby the fuses may be withdrawn.

Standard for use only at service entrances and meters.

Approved August 19, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

NORTHAMPTON, MASS.—The city authorities have voted to install 76 nitrogen-filled lamps of 250 candlepower each, two on each of 38 electric railway poles. Fifty-eight of the units will be operated until midnight and 18 all night. The lighting company's contract for maintaining and supplying energy is $2,280 total per year, or $30 per lamp.

IRONDEQUOIT, N. Y.—A movement is on foot in Irondequoit to illuminate East Side Boulevard, Rocky Beach Road, Ridge Road, Wooman Road, Hudson Avenue, and Garden Street, with electric lighting. A petition has been filed with Supervisor Louis J. Dubelbeiss.

SYRACUSE, N. Y.—The North Syracuse Light & Power Company has been granted a franchise for the extension of its lines and business into the towns of Cicero, Hastings and Central Square.

MARTINSBURG, PA.—An electric light plant will be installed here in the near future if the plan which is under way at present is indorsed by the Town Council. S.

PITTSBURGH, PA.—The Board of Education of the Pittsburgh schools is planning for the erection of power plants in at least five schools. S.

WASHINGTON, PA.—An application for a Pennsylvania charter of incorporation will be made for the Washington-Monongahela Electric Street Railway Company by Robert R. Reed, T. B. H. Brownlee, Andrew M. Linn, Joseph C. Spriggs and Alexander P. Reed. The new concern will construct an electric street railway at Washington, Pa. S.

SOUTH ATLANTIC STATES.

LYNCHBURGH, VA.—E. C. Wiley has prepared and submitted plans for a municipal electric light plant to cost about $150,000.

WESTMINISTER, S. C.—The city has voted $16,000 in bonds to erect an electric light plant. Address H. B. Gilbert, mayor, in regard to the matter.

HELENA, GA.—An election will be held October 17 upon the issuance of $1,000 of municipal bonds for improving the electric lighting plant. Address J. S. McLaughlin, mayor, for general information.

NORTH CENTRAL STATES.

YOUNGSTOWN, O.—Hundreds of acres of land between Coalburg and Brookfield have been quietly acquired during the past few months by Youngstown interests. The Mahoning Valley Water Company is purchasing the land for the development of water power. D. M. Wise, civil engineer, here, has been employed by the concern in working up plans for the building of dams and reservoirs.

SPENCERVILLE, O.—Bonds have been offered for sale for the purpose of securing funds for the construction of an electric light and power plant, in this place.

INDIANAPOLIS, IND.—The Board of Park Commissioners is planning a new park and boulevard lighting contract. Address the city clerk for information.

EMDEN, ILL.—The Emden Water, Light & Power Company has been licensed to incorporate. The company's capital stock is $2,400 and it is to manufacture, produce and sell gas, electricity and water. The incorporators are B. M. Barringer, J. H. Butler, T. U. Rademaker, H. W. Alberts, R. L. McCormick and Cyrus J. McCormick.

HILLSBORO, ILL.—Members of the City Council and the Hillsboro Commercial club are co-operating in a plan for an ornamental lighting system for the city. Z.

GRAND RAPIDS, MICH.—The Board of Supervisors of Newaygo County and the Grand Rapids-Muskegon Power Company have made an agreement relative to the building of four dams on the Muskegon River.

ANTIGO, WIS.—Plans are being made to install a decorative lighting system and to place the cables under ground. C.

MAZOMANIE, WIS.—It has been decided to build an electric transmission line to the plant of Wisconsin River Power Company, near Prairie Du Sac. H. L. Swan is clerk. C.

BROOKSTON, MINN.—$6,000 will be expended improving the light and water system. Address the village clerk for information.

RADCLIFFE, IOWA.—The Iowa River Power & Light Company plans to have its line extended to Radcliffe.

TROY, MILLS IOWA.—A company has recently been incorporated with a capital of $40,000 to develop water power and install an electric lighting plant to light surrounding towns. Address W. R. Furman, president, or W. F. Stauffer, secretary, for information.

CORDER, MO.—The city contemplates securing electricity for lighting and power from the plant at Higginsville.

ST. LOUIS, MO.—The Meldrum Bunsen Light Company has been incorporated with a capital of $2,000 by Philip I. Nassauer and others.

KANSAS CITY, KANS.—Bids on a 3,500-kilowatt turbine generator with condenser equipment, switchboard, etc., and the equipment for increasing the capacity of the municipal light and power plant, will be asked for soon. L. H. Chapman is commissioner of water and light, and E. N. Stevens, Scarritt Building, Kansas City, Mo., is consulting engineer. M.

SOUTH CENTRAL STATES.

CHATTANOOGA, TENN.—The Chamber of Commerce plans to extend the "White Way" on Market Street. Address the secretary for particulars.

FLORENCE, ALA.—Papers of incorporation for the Allentown Power Company have been filed. The company has a paid up capital stock of $200,000, and the following are the officers: Col. N. F. Thompson, of Birmingham, president; T. W. Pratt, of Huntsville, vice-president; Thurston H. Allen, of Florence, secretary and treasurer. The company recently purchased a large tract of land on Cypress Creek, just west of Florence, with riparian rights to five water powers. The company will immediately build two hydroelectric plants; chemical works will also be built, at first to run by steam power. A fertilizer plant and factories for crushing and grinding limestone are having the immediate developments planned.

WESTERN STATES.

WILBAUX, MONT.—The proposition of granting a franchise for the construction of an electric light and heating plant here, to Henry Zolphi, will be voted on at a special election to be held sometime in November. It is understood that the proposed plant, if built, will cost about $25,000. O.

BOULDER, COLO.—Western Power Company has received a new lighting franchise, and extensive improvements will be made.

LIMON, COLO.—The Limon Buck Company will establish an electric light and brick-making plant.

DEMING, N. M.—The Phelps-Dodge Company will install an electric lighting and power plant here at once, the work being in charge of Albert Kohler.

LAS VEGAS, N. M.—An ornamental lighting system is to be placed on the grounds of the New Mexico Normal University at this place. Bids will be asked for in a few weeks.

COEUR d' ALENE, IDAHO.—The street lamps on Fourth Street are to be increased in number and increased in size from 40 watts to 60 watts.

PECK, IDAHO.—P. S. Lantzy, of Spokane, will install an electric plant on the site where the old Dakin mill was burned about a year ago. The total cost when completed will be about $20,000.

DUNCAN, ARIZ.—F. G. Baum, of San Francisco, and John Christy, of Clifton, Ariz., now have surveyors at work on surveys for a hydroelectric plant on Black River near this place.

NOGALES, ARIZ.—The Corporation Commission of Arizona has confirmed an electric lighting franchise granted last spring by the people of Nogales to the International Gas Com-

pany of that place. The president of the company announces that an effort will be made to have the plant in operation within eight months.

SEATTLE, WASH.—Residents of Seahurst and Three Tree Point recently petitioned Superintendent of Lighting Ross for the extension of lighting and power service into their localities.

SPOKANE, WASH.—Ornamental street lamps are to be installed on First, Trent and Sprague Avenues in the business section.

LOS ANGELES, CAL.—Bids are being received by the Pacific Light & Power Corporation, 624 Pacific Electric Building, for the construction of a 50,000-volt transmission line nine and one-half miles long between the company's Indian Creek switching station and the Kern County Quarry at Keen, Cal.

NORWALK, CAL.—Plans are under way here to establish a lighting district.

OAKLAND, CAL.—The City Council has passed a resolution authorizing the erection of electroliers on College Avenue in this city.

POMONA, CAL.—Plans are being considered by the City Council and the Southern California Edison Company for the ornamental lighting of the down town portion of this city.

RIVERSIDE, CAL.—The Southern Sierras Power Company will extend its high power line to Oceanside, tapping Elsinore, Fallbrook and other intermediate points.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices at New York, N. Y., Chicago, Ill., New Orleans, La., San Francisco, Cal., Atlanta, Ga., Seattle, Wash., and Boston, Mass. Apply for addresses in letter form, giving file numbers.]

NO. 13,705. ELECTRIC BULBS, ETC.—A cable was received from an American consul in Russia stating that a person in his district desires prices delivered on electric bulbs, zinc, lead, and ferromanganese from reliable American firms.

NO. 13,821. ELECTRICAL APPARATUS.—A dealer in electrical apparatus, such as motors, dynamos, motor generators, telephones, bells, annunciators, and other accessories, has advised an American consular officer that he desires to be placed in touch at once with American manufacturers of such articles. Correspondence may be in English.

NO. 13,795. ELECTRICAL SUPPLIES.—An American consular officer in the Levant states that a large firm in his city wishes to get into touch with American manufacturers of all kinds of electrical supplies.

NO. 13,799. ELECTRICAL MACHINERY AND SUPPLIES, ETC.—A dealer in Greece has advised an American consul that he desires to represent American firms for the sale in his territory of gas, petrol, and steam engines, electric motors, dynamos, telephones, wires and cables, insulators, metal cross-arms, brass, brass and copper wire, bimetallic wire, and railway supplies. The prices and date of delivery of brass and copper and bimetallic wire are desired at once. Correspondence may be in English, but if possible the letters should be in French.

NO. 13,187. HEATING APPLIANCES AND ELECTRIC LIGHTING FIXTURES.—An American consular officer in Canada reports that two churches are being erected in his district and that the contractors and builders concerned desire catalogs and quotations of American manufacturers of and dealers in heating appliances, structural steel, milled ironwork (columns, etc.), plumbing, and woodwork, and electric lighting fixtures.

NO. 13,789. ELECTRIC-LIGHT PLANTS FOR CHINA.—An American consular officers in China reports that an effort is being made to establish two electric-light plants in his district; that the enterprise is being largely promoted by one who is familiar with American electrical machinery; that orders will be placed for boilers, electrical materials, fixtures, etc.

PROPOSALS.

ELECTRIC WIRING.—Separate contracts for electric wiring will be let by the State Board of Administration in several buildings, bids for which will be received until October 19, at the Capitol Building, Springfield, Ill.

ELECTRIC LIGHTING FIXTURES.—Bids are being called for the furnishing and installing of complete electric lighting fixtures in the new Clallam County Court House, Port Angeles, Wash.

MOTOR-DRIVEN PUMP.—Sealed proposals for furnishing and erecting motor-driven centrifugal pumping machinery as per Contract No. 26 will be received until October 12 by the director of public service, Columbus, O., in accordance with plans and specifications on file in the office of said director.

ELECTRICAL EQUIPMENT. — Bids will be received October 17 for an engine, generator, storage battery, switchboard, power house and pole line to be installed and erected in Sergeant Bluff. Plans are in the hands of the clerk of Village Board, and with the Ryan Electric Company, 312 Pierce Street, Sioux City, Iowa.

ELECTRICAL CONSTRUCTION, ETC.—The Board of Supervisors, San Francisco, Cal., is asking for bids for furnishing and installing underground conduit; furnishing and delivering motor-generator sets and dynamos; and furnishing and installing fire-alarm switchboards, all for the San Francisco Fire-Alarm Central Station.

PROGRAM BELLS, FIRE-ALARM SYSTEM, ETC.—Sealed proposals for the construction of interior telephones, clocks, program bells and fire-alarm system for the State Normal School, Buffalo, N. Y., will be received by Dr. Thomas E. Finegan, assistant commissioner for elementary education, Education Building, Albany, N. Y.

MATERIAL FOR UNDERGROUND-CABLE WORK. — Sealed proposals will be received at the office of the General Purchasing Officer, Panama Canal, Washington, D. C., until October 16 for furnishing under Canal Circular 868-G material for underground-cable work at Ancon, Balboa and Gatun. For further information address F. C. Boggs, general purchasing officer.

NEW INCORPORATIONS.

PHILADELPHIA, PA. — A charter has been filed here for Electric Safety Brake Company, having a capital stock of $100,000.

NEW ALBANY, IND. — Electric Machine Company has been incorporated, capitalized at $6,000, by Fred Kahler, H. U. Lobach and Fred Kahler, Jr.

PHOENIX, ARIZ.—American Prepay Electric Fan Company has been incorporated with a capital stock of $6,000,000 to deal in electrical goods and to erect suitable plants therefor.

HAMILTON, MO.—Certificate of incorporation has been filed by the Hamilton Light & Power Company, with a capital of $30,000 by C. A. Martin, True D. Parr and J. W. McLean.

VINE GROVE, KY.—The Rex Revolving Light Company has filed articles of incorporation, capitalized at $15,000. The incorporators are W. D. Carter, Ulie Richardson and J. R. Davis.

NEW YORK, N. Y.—G. & G. Electric Supply Company, Incorporated, has been granted articles of incorporation, capitalized at $2,500. The incorporators are Morris Zippert, Morris Drucker and Gabriel Soffer, all of this city.

HOUSTON, TEX. — Permit to do business in Texas has been granted the United Gas & Electric Engineering Corporation of New York, the capital stock of which is $100,000; principal place of business in Texas to be at Houston.

NEW, YORK, N. Y.—Premier Electric Welding Company, Incorporated, has been granted articles of incorporation, capitalized at $20,000. The incorporators are Hugo Tessensohn, William C. Steiger and Rudolph Marks, all of this city.

NEW YORK, N. Y.—M. Schweiger & Company, Incorporated, has been granted articles of incorporation, capitalized at $1,000 to engage in electrical contracting. The incorporators are Joseph A. Michel, Josephine M. Fischer and Harold Turk.

WILMINGTON, DEL. — Latin-American Car & Coast Lighting Company has been incorporated to conduct lighting plants. The capital stock is $700,000 and the incorporators are S. S. Adams, Jr., H. M. Kennedy and M. B. F. Hawkins, of this city.

HAMILTON, O. — The Economy Electric Company has been incorporated with a capital stock of $10,000 to operate electric lighting plants. The incorporators are Don Stuart, Robert O'Connell, Melville L. Spence and Egbert and E. L. Dollinge.

DUBUQUE, IOWA. — Articles of incorporation of the Keller Electric Company have been filed. The incorporators are C. H. Keller and C. E. Murphy. The concern has a capital stock of $10,000 and is to have a life of 20 years. Mr. Keller is to be president and general manager.

CHICAGO, ILL.—The Harten Manufacturing Company, of Chicago, has been licensed to incorporate. The capital stock is $2,500. It is to manufacture and deal in electrical devices for heating, lighting, display, signs, etc. The incorporators are Harry Hamill, Frank A. Ramacitti and Ernest Saunders. Z.

FINANCIAL NOTES.

At the annual meeting of the Philadelphia Traction Company retiring directors were re-elected.

The Pennsylvania Water & Power Company is offering to stockholders $500,000 of its first-mortgage five-per-cent bonds, dated January 27, 1910, and due January 1, 1940, at 88 and accrued interest. Subscriptions will be received up to the close of business on October 30. Bonds are payable 50 per cent on or before October 30 and 50 per cent on or before December 29. Proceeds of the sale are to be used to reimburse the treasury for income used on extensions.

The Boston Elevated in September increased its gross earnings by $40,000 over the same month a year ago, or about three per cent. The favorable riding weather in the first three weeks of the month accounts for the larger number of passengers carried. In the three months of the new fiscal year which have already elapsed, the elevated is ahead about $69,400 in gross, July having improved $24,400 and August $5,000 over the corresponding months of 1913. The $40,000 gain in September is the largest increase of any month since May last, when it amounted to $85,000.

Charles F. Cushman, secretary of the proxy committee of the New York Railways Company, is sending a circular to holders of the adjustment income mortgage bonds in which he says in part: "At the coming annual meeting in December of New York Railways Company, the adjustment income mortgage bonds are entitled to elect five of the eleven directors. The following committee has consented to receive proxies for this meeting: Darwin P. Kingsley, president New York Life Insurance Company, New York; William A. Day, president Equitable Life Assurance Society, New York; Haley Fiske, vice-president Metropolitan Life Insurance Company, New York; Allan Forbes, president State Street Trust Company, Boston. The suit entered in the courts by New York Life Insurance Company on behalf of all said bondholders to reopen and recast the accounts under which interest payments were made for years 1912 and 1913, on the ground that money properly due the bondholders has been withheld, is being actively prosecuted with hope that a material additional payment may be secured on account of the coupons for those years. The bondholders can forestall future questions of the same sort and make sure that from now on those income bonds receive every dollar of interest to which they are entitled, by standing together and electing directors who will protect their interests."

Dividends.

	Term.	Rate.	Payable.
Am. Pub. Util. pf....	Q	1.5 %	Oct. 10
Commonwealth Edison —		2 %	Nov. 2
Commonwealth Pr., Ry. & Lt., com.	Q	1 %	Nov. 2
Commonwealth Pr., Ry. & Lt. pf	Q	1.5 %	Nov. 2
Ill. No. Util. pf.....	Q	1.5 %	Nov. 2
Niagara Falls Pr.....	Q	$2	Oct. 15
No. States Pr. pf....	Q	1.75%	Oct. 15
Ottumwa Ry. & Lt. pf.	Q	1.75%	Oct. 15
P. S. C. of Ill.....	Q	1.25%	Nov. 2
P. S. C. of No. Ill. pf.	Q	1.5 %	Nov. 2
Springfield & Xenia pf. —		2 %	Sept. 30
United Elec. Sec. pf..S-A		$3.50	Nov. 2
United Rys. & Elec., Balt.	Q	1 %	Oct. 15
W. States Gas & El...	Q	1.75%	Oct. 15

Reports of Earnings.

SOUTHWESTERN POWER & LIGHT COMPANY.

	1914	1913
August gross .....$	234,688	$ 185,500
Net after taxes.....	107,128	87,284
Twelve months' gross	2,652,069	2,131,418
Net after taxes.....	1,191,909	954,411

MT. WHITNEY POWER & ELECTRIC.

	1914	1913
August gross .....$	59,617	$ 54,029
Net after taxes.....	39,964	29,501
Surplus after charges.....	23,579	18,868
12 months' gross.....	634,681	519,288
Net after taxes.....	364,129	277,938
Surplus after charges.....	230,703	176,856

ADIRONDACK ELECTRIC POWER CORPORATION.

July gross .....$	92,148	$ 96,678
Net	21,647	17,627
Balance after charges..	604	*3,592
12 months' gross.....	1,249,105	1,167,202
Net	286,983	329,293
Balance after charges..	134,285	76,363

*Deficit.

WISCONSIN EDISON COMPANY.

		Inc. %
Eight months' gross.....	$5,763,193	3.04
Net	2,207,370	2.04
Balance for depr. and Wis. Ed. stock	1,104,803	*3.78
Twelve months' gross.....	8,727,028	4.45
Net	3,522,861	4.74
Balance for depr. and Wis. stock	1,938,513	3.07

*Decrease.

NORTHERN OHIO TRACTION & LIGHT.

	1914	1913
July gross .....$	351,658	$ 319,131
Net after taxes.....	145,488	133,945
Surplus after charges..	94,640	86,356
Seven months' gross..	2,073,359	1,816,369
Net after taxes.....	807,554	702,724
Surplus after charges..	454,871	384,411

CONSUMERS POWER COMPANY OF MAINE.
(Including Construction Companies)

	1914	1913
August gross .....$	269,855	$ 237,209
Net earnings	161,168	91,776
Surplus after charges	66,091	25,682
Twelve months' gross	3,354,905	3,037,212
Net earnings	2,067,194	1,436,548
Surplus after charges	947,131	731,137

CITIES SERVICE COMPANY.

	1914	1913
August gross .....$	264,880	$ 137,137
Net after expenses...	252,580	127,583
Balance after interest	211,747	112,201
Balance after preferred dividends ..	74,914	48,662
Twelve months' gross	3,671,480	1,540,691
Net after expenses...	3,571,465	1,461,819
Balance after interest	3,225,022	1,428,533
Balance after preferred dividends ...	1,729,604	716,653
Surplus after common dividends	1,060,477	375,051

Total accumulated surplus to August 31, 1914, $2,830,632.

NEW PUBLICATIONS.

RESUSCITATION FROM MINE GASES.—Technical paper No. 77 of the Bureau of Mines, Washington, D. C., is entitled "Report of the Committee on Resuscitation From Mine Gases," by W. B. Cannon, George W. Crile, Joseph Erlanger, Yandell Henderson and S. T. Meltzer. This publication contains 36 pages and fully describes the various methods of resuscitation, discussing the merits of each.

BIG CREEK DEVELOPMENT.—The Stone & Webster Construction Company has published a very finely illustrated description of the initial development at Big Creek, Cal., for which it was the constructing engineer for the Pacific Light & Power Corporation. A very large number of illustrations adorn the pages of this publication. Included among these are some colored views of the rugged mountain district in which the two power houses are located. There are also a large number of detail views showing various stages of construction and the completed dams, plants, substations, etc. Maps and plats are also given. This initial construction work involved the erection of four dams, two tunnels, two power houses, two transmission lines of 240-mile length, a substation and 56 miles of railroad. The power lines run to Los Angeles, Cal.

PERSONAL MENTION.

MR. J. U. BENZINGER has been appointed authorized agent for the Alabama Power Company in Alabama, with headquarters at Ocampo.

MR. E. A. LAMBRECHT has recently been appointed manager of the Wisconsin district office of the Federal Sign System (Electric), with offices in the Public Service Building, Milwaukee.

MR. F. D. SWEET has been appointed manager of the Indianapolis, Ind., office of the Federal Sign System (Electric), with offices at 115 East Ohio Street.

MR. HARTLEY ROWE, electrical superintendent of Balboa Heights, Canal Zone, has been acting in the capacity of electrical engineer during the leave of absence of Capt. W. H. Rose.

MR. HARRY F. THOMSON, secretary of the Electrical Engineering Research Laboratory in the Massachusetts Institute of Technology, Boston, has been granted a leave of absence from October 15, and will be located in St. Louis for the winter, with the Provident Chemical Company.

MR. WALTER HAYNES, of Portland, Ore., has been appointed assistant in electrical engineering in the Massachusetts Institute of Technology, Boston. Mr. Haynes graduated in 1907 from Leland Stanford, Jr., University, in the course in electrical engineering, and since that time has taught in schools on the Pacific Coast.

MR. ARTHUR W. SUMNER, for the past ten years assistant superintendent of the Rockingham County Light & Power Company, Portsmouth, N. H., has tendered his resignation, effective October 15. Mr. Sumner has made many friends who will wish him the best of success in whatever business he may engage in the future.

MR. WALTER B. SNOW, publicity engineer handling a number of electrical accounts, has removed his offices to the new Federal Street Building, Boston, Mass. Mr. Snow will be still better equipped to act as the publicity department of a select number of clients in engineering and general fields, and to render the regular service of an advertising agency.

MR. N. A. KELLY, who has for three years been chief clerk to Manager M. L. Levy of the Bell Telephone Company at New Castle, Pa., has been promoted to salesman for the company in that district. Mr. Kelly is very popular among the employees of the company and also has many friends in the city who will be pleased to learn of his advancement.

MR. O. H. CALDWELL has returned to the electrical fraternity in Chicago as associate editor of the *Electrical World*. Mr. Caldwell graduated from Purdue University in 1908 and was for a short time connected with the *Western Electrician* and later on with the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. After a period of a little over a year in the publicity department of the Westinghouse Electric & Manufacturing Company he joined the staff of the *Electrical World* for about two years in Chicago and then in New York.

MR. THURSTON OWENS, secretary of the San Diego (Cal.) Gas &

Electric Appliance Company, has been elected president of the San Diego Electrical League. That it is not necessary for a man to be a "native son" to obtain recognition among the electrical men in California is demonstrated by this election, as Mr. Owens is a newcomer in that part of the country. He was formerly manager of the La Crosse (Wis.) Gas & Electric Company, and has been in the public-utility business for 15 years. He is the local secretary of the Illuminating Engineering Society, a Jovian, and a member of several gas and electric associations.

DR. ARTHUR E. KENNELLY, professor of electrical engineering at Harvard University, has been given general direction of research work in the Massachusetts Institute of Technology, Electrical Engineering Research Laboratory, under the plan of co-operation between the two institutions. He succeeds DR. HAROLD PENDER, who has joined the faculty of the University of Pennsylvania. Dr. Kennelly was born in Bombay, India, in 1861, and was captain in the East Indian Navy in his youth. He was educated at University College, London, and obtained his Sc. D. degree in the Western University of Pennsylvania. He engaged in telegraph and cable work until 1887, when he became principal electrical assistant to Thomas A. Edison. In 1894, with Prof. Edwin J. Houston, he engaged in consulting engineering work in Philadelphia. He was in charge of laying the Mexican Government cables in the Gulf of Mexico in 1902. That year he became professor of electrical engineering in Harvard University. He was president of the American Institute of Electrical Engineers, 1898-1900. He is the author of a number of technical books and magazine articles. He received the honorary degree of A. M. from Harvard in 1906.

MR. WILLIAM E. KEILY has resigned as associate editor of the *Electrical World*. He will devote himself to special literary work hereafter. Mr. Keily has been connected during his entire business career with the printing and publishing business. In 1880 he entered the printing business, a few years later becoming a reporter on the *Post Express* of Rochester, N. Y. Since 1891 Mr. Keily has resided in Chicago, engaging ever since in electrical journalism. He became managing editor of the *Western Electrician* in 1889, and when this publication was consolidated with the *Electrical Review* of New York in 1908 for a short time he engaged in free lance newspaper work. On March 1, 1909, he was appointed associate editor of the *Electrical World*, making his headquarters in Chicago and covering diligently and with great satisfaction the news of the entire central and western states for that publication. In his journalistic connection Mr. Keily has contributed greatly to the development of the electrical industry. He is an associate member of the American Institute of Electrical Engineers, the Illuminating Engineering Society, the National Electric Light Association, the Electric Vehicle Association, the Electric Club and the Jovian Order. On September 26, Mr. Keily was tendered a dinner by Mr. James H. McGraw, president, and members of the Chicago staff of the McGraw Publishing Company.

MR. JAMES T. BOUSTEAD has organized the Boustead Electric & Manufacturing Company, with offices and salesrooms at 215 First Avenue, Minneapolis. Mr. Boustead has had a long connection with the electrical industry. He installed the first dynamo in Minneapolis in 1881 at the Falls Station of the old Brush Electric Company. For five years he acted as superintendent of this company. Mr. Boustead organized the

J. T. Boustead.

Electric Machinery Company of Minneapolis 23 years ago and has just resigned to become active manager of the new company. The Boustead Electric & Manufacturing Company will manufacture a complete line of machinery including switchboards and controlling apparatus. The plant of the United Electric Motor Works, of Menominee, Wis., has been moved to Minneapolis to be consolidated with the new plant of the Boustead Company.

MR. PHILIP NUNGESSER, founder of the Nungesser Carbon & Battery Company, and inventor of the "1900" and Acme rapid-fire dry batteries, has been tendered a handsome silver lov-

Philip Nungesser.

ing cup by the directors of the Nungesser Carbon & Battery Company, commemorating his 25 years of association with the business, dating from September, 1889. Mr. Nungesser's researches and experiments have covered every phase of dry-battery development. He is a scholar, scientist and inventor, and has brought to bear upon his life work the attributes and characteristics of each. In September, 1889, Mr. Nungesser sold the first dozen of his cells. At that time the output amounted to a few sets of batteries a month. How the dry-battery business has grown is indicated by the fact that about 40,000,000 dry cells are made and sold in this country each year at the present time. Through his efforts in bringing the dry battery to perfection, Mr. Nungesser discovered certain important principles bearing upon the production of carbon, with the result that the carbon industry is today an important branch of the Nungesser Carbon & Battery Company's business.

MR. ALFRED MONTGOMERY, who for the past two years has been manager of the Leominster (Mass.) Electric Light & Power Company and the Leominster Gas Light Company, has formally severed his associations with these companies, and has been succeeded by MR. ROSCOE CONKLIN, who for some time has been connected with the Boston offices of the company. Mr. Montgomery will return to his former home in England.

OBITUARY.

MR. JAMES H. KIEFER, traveling electrical engineer with the Dayton Engineering Laboratories Company, stationed in Berlin, Germany, at the time of the outbreak of the war, died on September 29 at his home in Dayton, after an illness of some weeks. He was ill in a Berlin hospital for two weeks, leaving for this country on August 29. Mr. Kiefer was born in Lawrenceburg, Ind., and was 25 years of age. He became connected with the Dayton concern in 1910, and was sent to Germany to represent the company a year ago.

MR. HARRY M. RAPHAEL, a member of the Raphael Electric Company, Pittsburgh, Pa., died at the Passavant Hospital, on September 30, after a brief illness. Mr. Raphael was prominent in several organizations and clubs, and, although a comparatively young man, was one of the five original founders of the Zionist movement in Pittsburgh. He was a member of the Jovian Order of Pittsburgh, and of the Pittsburgh Press Club. His mother, Mrs. Rachael Raphael; four brothers, Benjamin, Nathan, Israel and Lazarus, and four sisters, Mrs. Samuel Rosenthal, and the Misses Jennie, Rosie, and Sadie, survive him.

MR. GARDINER M. LANE, of the firm of Lee, Higginson & Company, Mass., died at his home in that city October 3, at the age of 55. He was a native of Cambridge, Mass., and a graduate of Harvard University in the class of 1881. He was assistant to the president, and later vice-president of the Union Pacific Railroad, returning to Boston in 1892. He was a director in the Massachusetts Electric Companies, the Pennsylvania Water & Power Company, Seattle Electric Company, Fuget Sound Electric Railway Company, and the Montana Power Company. He was a philanthropist and a patron of the fine arts.

DATES AHEAD.

New York Electrical Exposition and Motor Show of 1914. Grand Central Palace, New York, N. Y., October 7-17. General manager, George F. Parker, 124 West Forty-second Street, New York, N. Y.

American Institute of Electrical Engineers. Philadelphia, Pa., October 12. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 12-16. Secretary, Miss E. B. Burritt, 29 East Thirty-ninth Street, New York, N. Y.

Jovian Order. Annual congress, St. Louis, Mo., October 14-16. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Arkansas City, Kans., October 22-24. Secretary, W. H. Fellows, Leavenworth, Kans.

Association of Railway Electrical Engineers. Annual convention, Chicago, Ill., October 26-30. Secretary, J. A. Andreucetti, Room 411, Chicago & Northwestern Terminal Station, Chicago, Ill.

Telephone Pioneers of America. Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York, N. Y.

With the Electrical Manufacturers

The Triumph Electric Company, Cincinnati, O., announces that it has opened a new office at 114 Liberty Street, New York City, in charge of W. B. Elliott.

Appleton Electric Company, Chicago, Ill., has issued a small booklet, giving in condensed, illustrated form, a complete listing of its well known Unilet conduit fittings.

The Diehl Manufacturing Company, Elizabeth, N. J., announces that B. C. Kenyon, who for a number of years has been president of the company, has resigned on account of ill health.

O. J. Goettmann, 525 East Ohio Street, Pittsburgh, Pa., has ready for distribution an interesting catalog illustrating and describing low-voltage transformers. Copies of this catalog may be secured upon request.

Mathias Klein & Sons, 562 West Van Buren Street, Chicago, have prepared an attractive poster as a fall-trade stimulus to the electric lighting industry. Some sound advice is given, which it would be well for certain ultra-conservative utility managers to follow.

Simplex Wire & Cable Company, 201 Devonshire Street, Boston, Mass., has issued a reprint of the paper by W. I. Middleton and Chester L. Dawes entitled "Voltage Testing of Cables," which was presented at the annual convention of the American Institute of Electrical Engineers at Detroit, last June.

The Cutter Company, Philadelphia, Pa., is out with the first calendar in extenso beginning with October, 1914, and running to September, 1915. Each leaf of the calendar is illustrated with a reproduction of I-T-E circuit-breaker equipment and an epigram relating to the service characteristics of this apparatus.

Robbins & Myers Company, Springfield, O., has issued a bulletin on steel-frame direct-current motors. This bulletin gives the mechanical and electrical details of these motors which are made in the open, fully inclosed, semi-inclosed and grid-type frames. Numerous illustrations are shown and the ratings of all machines are given.

Morrison & Company, engineers and merchants, Valparaiso, Chili, South America, have secured the major part of the Chilian navy contracts for a period of three years. This is the third successive occasion upon which the company, which has offices at 17 State Street, New York, has obtained these naval contracts for general supplies, the two previous contracts being for periods of five years each.

Electric Machinery Company, Minneapolis, Minn., has recently issued a number of illustrated circulars describing its line of horizontal and vertical-shaft alternators for various types of drive and induction motors. The company has recently found it necessary to establish an additional factory branch office at 515 Putman Building, Davenport, Iowa. Ralph B. Coleman is the district manager in charge of this office, which is ready to give immediate attention to all inquiries from that territory.

Beardslee Chandelier Manufacturing Company, Chicago, Ill., has designed a very attractive booklet entitled "The Gift of Gifts." This booklet is printed on fine stock and handsomely decorated. It illustrates and describes the company's numerous types of table and desk lamps, giving prices in all cases and suggesting appropriate lamp gifts for every adult member of a family. Many new and attractive designs are shown. The company will send this booklet free of charge to customers of any dealer and a personal follow-up advertising material will be furnished free of charge to dealers using the plan.

Bryant Electric Company, Bridgeport, Conn., has recently issued a handsome bulletin illustrating and describing the Bryant silent-call signal systems for hospitals. This is a simple electric-light annunciator system that requires no special apparatus and has no moving or working parts to get out of order. When desired an audible signal may be arranged for night service, and an elapsed-time recorder can be easily connected to the system to show the time elapsed before a call is answered. This system is also adapted for service in hotels, offices, department stores, public buildings, etc. The bulletin is well illustrated by reproductions of the various parts of the system and of numerous installations.

Sprague Electric Works of General Electric Company, New York City, has issued a number of new publications, of which booklet No. 906 contains a series of illustrations of Sprague electric hoists for the efficient handling of all loads. Bulletin No. 48,700 is a 48-page catalog of monorail cranes. This bulletin is copiously illustrated with views of several types of these traveling cranes that have been found so serviceable in a variety of industrial establishments for handling all kinds of materials. Their construction is described in detail and their utility and other advantages are pointed out. Bulletin No. 48,701 deals with Sprague electric dynamometers. These have come into extensive use in automobile factories for testing gasoline and oil engines, accessories, the complete chassis, etc. This apparatus affords an accurate and convenient means for testing a variety of power equipment and at the same time returning the power developed to the electrical system on the premises, thus making for economy in the testing operation. The bulletin shows how this is accomplished and describes the details of the apparatus and the many advantages achieved by its use.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently received the following orders for textile machinery: Cheney Brothers, South Manchester, Conn., 616 textile motors and switches for silk looms. Livingstone Worsted Company, Washington, R. I., a 312-kilowatt water-wheel-driven generator, exciter, switchboard, and a number of type CS motors. Princeton Worsted Mills, Trenton, N. J., 102 loom motors and 43 type CS motors. Botany Worsted Mills, Passaic, N. J., 11 type CS motors. Germania Mills, Holyoke, Mass., a 500-kilowatt bleeder turbogenerator. Hockanum Mills, Rockville, Conn., a number of worsted-loom motors and switches. Wm. Skinner & Sons, Holyoke, Mass., several silk-loom motors and switches. Habersham Mills, Habersham, Ga., a 350-kilowatt generator, exciter and switchboard. Renfrew Manufacturing Company, North Adams, Mass., a number of type CS motors. Bitzer Brothers, Doylestown, Pa., 19 silk-loom motors. Paul Guenther, Dover, N. J., a 150-kilowatt direct-current generator. Ludlow Manufacturing Associates, Ludlow, Mass., 15 type CS motors totaling 2,075 horsepower. Hartford Carpet Corporation, Hartford, Conn., 13 carpet-loom motors.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has recently issued a number of new bulle-

tins. Bulletins Nos. 4500, 4510, 4520 and 4530 describe the new Cutler-Hammer line of automatic machine-tool controllers for use with shunt or compound-wound direct-current motors, adapted for constant or adjustable-speed work, with or without interpoles. Increased output and lower cost of production is claimed for this automatic control owing to the ability of the operator to start and stop without leaving his normal position; the possibility of the foreman setting the control at the proper speed for a job and leaving the operator free to start and stop, but unable to change speed; and the dynamic brake, by which a tool that would otherwise run several seconds after the power is cut off, is brought to rest practically at once by the motor, which acts as a generator and stops the tool. Bulletin No. 4510 describes automatic machine-tool controllers of the plain starting type; Bulletin No. 4520, those of the speed-setting type, and Bulletin No. 4530, those of the speed-regulating type. Bulletin No. 6753 describes double-pole diaphragm regulators for direct-current and alternating-current motors; Bulletin No. 7131, full magnetic controllers; Bulletin No. 9125, secondary resistance starting rheostats for polyphase slip-ring motors; Bulletin No. 9130, multiple-switch starters; Bulletin No. 9135, drum-type starters; Bulletin No. 9155 drum reverse switches; Bulletin No. 9320, panel-type speed regulators; Bulletin No. 9350, drum reversible crane controllers; Bulletin 9355, hoist controllers; Bulletin No. 9359, rope-operated drum reverse switch; Bulletin Nos. 9360 and 9365, speed regulators. All of these bulletins are illustrated by reproductions of controllers and their parts.

Record of Electrical Patents.

Issued by the United States Patent Office, September 29, 1914.

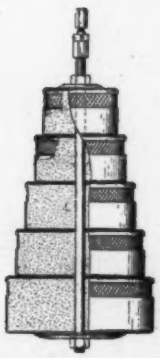
1,111,733. Transmitting Apparatus for Use in Electric Signaling on Railways. G. H. Brown, deceased, by H. Brown, executor, Belfast, Ireland. For use with an indicating clock.

1,111,738. Visual-Signal Device for Vehicles. A. F. Copersito, Brooklyn, N. Y., assignor of one-half to J. McMahon. An electric-light indicator.

1,111,742. Automatic Toll-Recorder for Telephone Systems. E. G. Godfree, Sandringham, Victoria, Australia. Is electromagnetically operated.

1,111,748. Speed-Controlling Device. K. L. Harter and H. T. Reynolds, Tampa, Fla. A speed indicator with adjustable contact for short-circuiting spark plug.

1,111,767. Film-Fire-Protection Device for Moving-Picture Films. D. O. Seaman, Des Moines, Iowa, assignor of one half to T. C. Smith. Includes automatic circuit-breaker for the motor driving the machine.



1,111,783.—Ground Connector.

1,111,782. Connector. W. C. Banks, assignor to N-W Equipment Co., New York, N. Y. For connecting electric wire to base of rail.

1,111,783. Ground Connection. W. C. Banks, assignor to N-W Equipment Co. A number of superimposed receptacles containing conductive hygroscopic materials are mounted on a contact rod. (See cut.)

1,111,790. Electric Heater. W. H. Fulton, New York, N. Y. Mounted in an outer radiating pipe.

1,111,792. Selective Signaling System. E. R. Gill, Yonkers, N. Y., assignor to Hall Switch & Signal Co. A telephone selective signaling circuit.

1,111,798. Electric Switch. C. J. Klein, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. A double-ended push-button swltch.

1,111,820. Canopy Insulator. E. E. Bechtold, Chicago, Ill. Flexible insulating ring for use between canopy and wall or other support.

1,111,848. Means for Electrically Determining Transmitted Power. W. E. McCoy and S. D. Sprong, New York, N. Y., assignors of one-third to Frank W. Smith. A generator and metering arrangement operated by deflection of driving shaft.

1,111,851. Signaling System for High-Voltage Railways. C. P. Nachod, Philadelphia, Pa. Conductors of railway and signal system electricaly connected and generator used to prevent flow of current between the two.

1,111,857. Controlling Device for Filtration Plants. W. J. Pike, Grand Rapids, Mich. A float-operated switch controls valves.

1,111,864. Electric-Lighting Apparatus for Velocipedes. A. Sanladerer, Ortenburg, near Vilshofen, Germany. A clutch-operated lighting generator.

1,111,866. Pulsation-Producing Device for Electrical Musical Instruments. M. L. Severy, Arlington Heights, and G. B. Sinclair, Boston, Mass. Is electromagnetically operated.

1,111,875. Lighting Fixture. F. W. Wakefield, assignor to The F. W. Wakefield Brass Co., Vermilion, O. A stamped sheet-metal outlet box with fixture-receiving plate. (See cut.)

1,111,876. Telephone System. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. A combined battery and magneto system.

1,111,884. Motor Gearing and Housing. S. Deutsch, Detroit, Mich. A combined housing and cup-shaped gear case.

1,111,898. Electrode for Electrolytic Measuring Instruments. H. S. Hatfield, Brunswick, Germany. A tube containing electrode and gas space, the electrode being arranged so that gas formed diffuses at once into the gas space.

1,111,930. Railway Signal and Switch Operating Means. P. G. Ten Eyck, Albany, N. Y. Switches and signals electrically operated from operator's station.

1,111,946. Receptacle for Travelers. B. E. Byrd, Durham, N. C. A rotatable cylinder with magnetically operated openings.

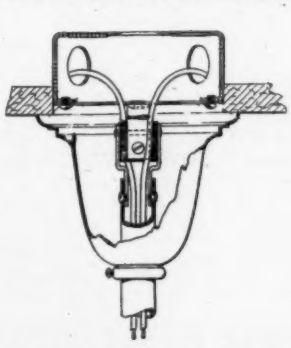
1,111,956. Electric Lamp. T. P. Driver, Melrose, Mass. A miniature lamp and reflector designed to be attached to dry cell.

1,111,963. Spark Gap. G. F. Knorr, Des Moines, Iowa. An inclosed spark gap with transparent windows.

1,111,977. Electrolytic Cell. C. C. Titus, assignor to Montana Metallurgical Co., Helena, Mont. Has two compartments separated by a diaphragm and foraminous cathode.

1,112,009. Apparatus for Operating Elevator-Doors. T. A. Holloran, Washington, D. C. A motor-operated door controlling apparatus which opens operating circuit upon opening door.

1,112,019. System of Selective Control of Remote-Control Switches. P. T. McNally, Dunlap, Iowa. A polarized-relay system.



1,111,875.—Outlet-Box Fixture Support.

1,112,022. Concatenated Control of Alternating-Current Motors. R. D. Mershon, New York, N. Y. Alternating-current motors arranged to permit capacity to be connected across secondary terminal of one or more motors when in concatenation.

1,112,028. Trolley-Pole Head. J. Paradowish, Brockton, Mass. Covers details.

1,112,047. Circuit-Wire Terminal. A. A. Ziegler, Boston, Mass. An elongated plate with binding screws. (See cut.)

1,112,140. Telephone System. D. S. Hulfish, assignor to Canadian Independent Telephone Co., Limited, Toronto, Can. Includes a call-answering plug,

a ringing plug and a ringing key opening the talking conductors between the call-answering plug and plug-pair apparatus while ringing.

1,112,143. Locking Device for Electrically Operated Pianos. J. F. Kelly, Pittsfield, Mass. Electrical means for locking and releasing keys of combined electrically and manual operated piano.

1,112,156. Fuse Switch. T. E. Murray, New York, N. Y. Fuse takes place of usual blade portion of switch.

1,112,161. Snap Switch. C. Roth, assignor to T. E. Murray, New York, N. Y. Covers details of contact portions.

1,112,165. Fluid Rheostat. A. Simon, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. Has means for insuring uniform distribution of fluid throughout width of tank.

1,112,167. Telephone Transmitter. J. L. Spence, assignor to Electrical Experiment Co., Inc., New York, N. Y. Diaphragm designed to give acoustic waves with a minimum of distortion.

1,112,169. Rheostat. L. L. Tatum, assignor to The Cutler-Hammer Mfg. Co. A grid-resistance rheostat.

1,112,170. Rheostat. L. L. Tatum, assignor to The Cutler-Hammer Co. A field rheostat with adjustable resistances.

1,112,172 and 1,112,173. Motor Vehicle. M. S. Towson, assignor to The Elwell-Parker Electric Co., Cleveland, O. Motor's shaft is longitudinal and motor is suspended in center of vehicle.

1,112,177. Electrical System. R. Varley, Englewood, N. J. An ignition system for internal combustion engines.

1,112,191. Carbon Brush and Pigtail. W. L. Bliss, assignor to Central Trust Company of New York. Pigtail fastened to carbon brush by means of U-shaped conductor fitted over brush and screwed to it.

1,112,196. Electric Regulation. J. L. Cheverling, assignor to Safety Car Heating Lighting Co. Voltage regulator for axle-lighting system.

1,112,197. Wall or Ceiling Fixture for Lights. D. Crownfield, Cambridge, Mass. Shade holder forms part of fixture pipe.

1,112,204. Safety Block System for Railroads. B. Fay, Danbury, Conn. A train-operated electromagnetic train-control device.

1,112,228. Electric Rat-Trap. C. W. N. Palmer, Greencastle, Pa. Internal surfaces are electrically charged.

1,112,253. Floor-Surfacing Machine. J. Bills, Casper, Wyo. Is motor operated.

1,112,265. Current-Rectifying Apparatus. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Rectifier for single-phase currents employing two mercury-arc rectifiers and four transformers.

1,112,266. Rectifier System. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. A similar system employing only two transformers.

1,112,278. Automobile Signal. R. G. Falconer, Washington, D. C. Electrically operated rear signal device.

1,112,282. Rectifier System. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. A combination of two transformers with a rectifying device across the secondary of each, the primaries being supplied from a single-phase source.

1,112,283. System of Electrical Distribution. J. J. Frank, assignor to General Electric Co. Mercury rectifier has a special inductance shunted across the alternating-current leads with a connection to a direct-current lead.

1,112,291. Sanitary Mouthpiece. E. M. Jenkins, Italy, Tex. For a telephone transmitter.

1,112,306. Electric Incandescent Lamp. R. A. Mahan, Jonesboro, Ark. An adjustable shade and reflector.

1,112,316. Alarm Lock. L. Percival, Tacoma, Wash., assignor to Alarm Lock Co. Rotation of door knob closes electric bell circuit.

1,112,331. Cable-Reeling Mechanism for Electric Traction Systems. E. L. Sessions, assignor to The Jeffrey Mfg. Co. A reel for winding up and paying out cable.

1,112,346. Mail Box. J. F. Wilcox, Earlsboro, Okla. Shutters of mail box have contacts closing bell and indicating circuit when mail is inserted.

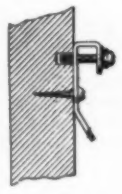
1,112,361. Arc-Light Electrode. C. W. Dake, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. Has longitudinal cooling ribs and transverse notches.

1,112,365. Electromechanical Warp Stop-Motion. G. J. Dustin, assignor to J. F. Dustin, Lawrence, Mass. For looms.

1,112,370. Coin-Controlled Pay Station for Telephones. A. B. Flagg and W. H. Livermore, assignors to Livermore Pay Station Co., Portland, Me. Covers details.

1,112,372. Train-Stopping Apparatus. A. H. Hussey, Whittier, Cal. A motor-operated braking system.

1,112,378. Switching Apparatus. H. F. Newbury, assignor to Elevator Supply & Repair Co., New York City. Switching arrangement for floor-lamp signals.



1,112,047.—Wire Terminal.

1,112,379. Elevator Signal System or Apparatus. H. F. Newbury, assignor to Elevator & Repair Co. A floor-lamp elevator signal system with "up" and "down" lamps.

1,112,385. Signal System. J. J. Ruddick, assignor to United States Electric Signal Co. A railway signal system employing insulated rail sections.

1,112,391. Thermostatic Circuit Controller. G. E. Spear, assignor to Standard Thermometer Co., Boston, Mass. A dial-type thermometer, the pointers of which are geared to contact-making devices.

1,112,392. Telephone Receiver. J. L. Spence, assignor to Electrical Experiment Company, Inc. Diaphragm held between air cushions.

1,112,411. Wave Detector. R. T. Ackley, Cortland, O. An electromagnetic wave detector employing a permanent magnet.

1,112,415. Line Connector. D. W. Kneisly, Dayton, O. A polarized relay.

Patents Expired.

The following United States electrical patents expired October 5, 1914.

590,967. Elevator Lock. M. J. Daly, Pittsburgh, Pa.

591,002. Electric-Bell Chimney Apparatus. N. McMenamin, Trenton, N. J.

591,011. Telephone System. A. W. Rose, New York, N. Y.

591,024. Dynamo-Electric Machine. M. E. Thompson, Ridgway, Pa.

591,026. Electric Arc Lamp. C. S. Van Nuis, New Brunswick, N. J.

591,042. Trolley for Electric Cars. W. L. Harvie, Newton, Mass.

591,051. Railway Switch. M. McCully, West Mansfield, O.

591,071. Electric Gas-Lighting Apparatus. A. L. Bogart, Jamaica, N. Y.

591,100. Electric Railway. J. C. Henry, Denver, Colo.

591,104. Insulator for Electric Wires. W. Roberts, Mobile, Ala.

591,105. Electromagnetic Braiding Machine. A. C. Shuttleworth, Philadelphia, Pa.

591,126. Plug Switch. W. R. Cole, Detroit, Mich.

591,127. Telephone-Exchange System. W. R. Cole, Detroit, Mich.

591,160. Electric Apparatus for Signal Purposes. W. E. Dow, Braintree, Mass.

591,162. Speed and Direction Indicator. B. A. Fiske, U. S. Navy.

591,179. Annunciator. F. P. Stevens, Colorado Springs, Colo.

591,182. Electric Arc Lamp. E. P. Warner and A. J. Oehring, Chicago, Ill.

591,192. Multiple Switchboard for Telephone Exchanges. W. S. Nash, Knoxville, Tenn.

591,194 and 591,195. Method of and Apparatus for Multiple-Rate Metering for Electric Currents. E. Oxley, Washington, D. C.

591,201. Electrical Exchange. A. B. Strowger, F. A. Lundquist, J. Erickson and C. Erickson, Chicago, Ill.

591,203. Commutator for Dynamo-Electric Machines. J. W. Wood, Fort Wayne, Ind.

591,210. Elevator Safety Device. R. T. Crane, Chicago, Ill.

591,217. Electric Clock. C. Gullberg, Jersey City, N. J.

591,233. Switch-Operating Mechanism for Cars. J. Lamontagne, Northampton, Mass.

591,241. Electrical Measuring Instrument. O. B. Shallenberger, Rochester, Pa.

591,242. Alternating-Current Electric Motor. O. B. Shallenberger, Rochester, Pa.

591,251. Trolley-Finder for Electrical Railroads. P. Goldsmith, Troy, N. Y.

591,262. Pneumatic and Electric Controlled Brake. H. S. Park, Chicago, Ill.

591,265. High-Tension Battery. R. Ashley, Port Republic, N. J.

591,267. Alternating-Current Generator. C. S. Bradley, Avon, N. Y.

591,268. Alternating-Current Motor. C. S. Bradley, Avon, N. Y.

591,300. Outlet Box for Electric Wiring. W. Soons, New York, N. Y.

591,301. Alternating-Current Electric Motor. W. Stanley, Jr., Great Barrington, Mass.

591,314. Electric Railway System. G. Westinghouse, Jr., Pittsburgh, Pa.

591,331. Electric Switch. W. A. Drewett, Brooklyn, N. Y.

591,339. Railway Telegraph. A. G. Frieseke, Floral Bluff, Fla.

591,343 to 591,345. Indirect Regulation of Dynamo-Electric Machinery. G. S. Dunn, East Orange, N. J.

591,365. Magneto-Electric Generator. J. A. Williams, Cleveland, O.

591,369. Illuminated Electric Sign. G. K. Burleigh, Northfield, N. H.